Single Aisle
TECHNICAL TRAINING MANUAL
T1+T2 (IAE V2500) (Lvl 2&3)
ICE & RAIN PROTECTION

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ICE & RAIN PROTECTION

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ICE AND RAIN PROTECTION SYSTEM COMPONENT LOCATION (2)

SYSTEM OVERVIEW

The ice and rain protection system enables unrestricted operation in icing conditions and heavy rain.
For anti-icing, hot air or electrical heating protects critical areas of the aircraft.
The different subsystems of the ice and rain protection system are:
- wing ice protection,
- engine air intake ice protection,
- probe ice protection,
- windshield ice and rain protection,
- drain mast ice protection,
- water and waste system ice protection (some are optional).
- visual lighted ice detection,
- electronic ice detection system (optional),

WING ANTI ICE PROTECTION

Hot air from the pneumatic system is provided for the anti-icing of the three outboard leading edge slats (3, 4 and 5) of each wing. Bleed air from the engines or the APU is supplied to each wing through a pressure regulating and shut off valve. Wing anti-ice supply to both wings is controlled by a single pushbutton switch on the overhead ANTI ICE panel.

ENGINE AIR INTAKE ANTI ICE PROTECTION

Each engine air intake is protected from ice by an independent air bleed supply from the high-pressure compressor of that engine. The air is supplied through the engine air intake anti-ice valve. Engine anti-ice is manually selected by the crew and is available in flight or on the ground with the engine running.

PROBE ICE PROTECTION

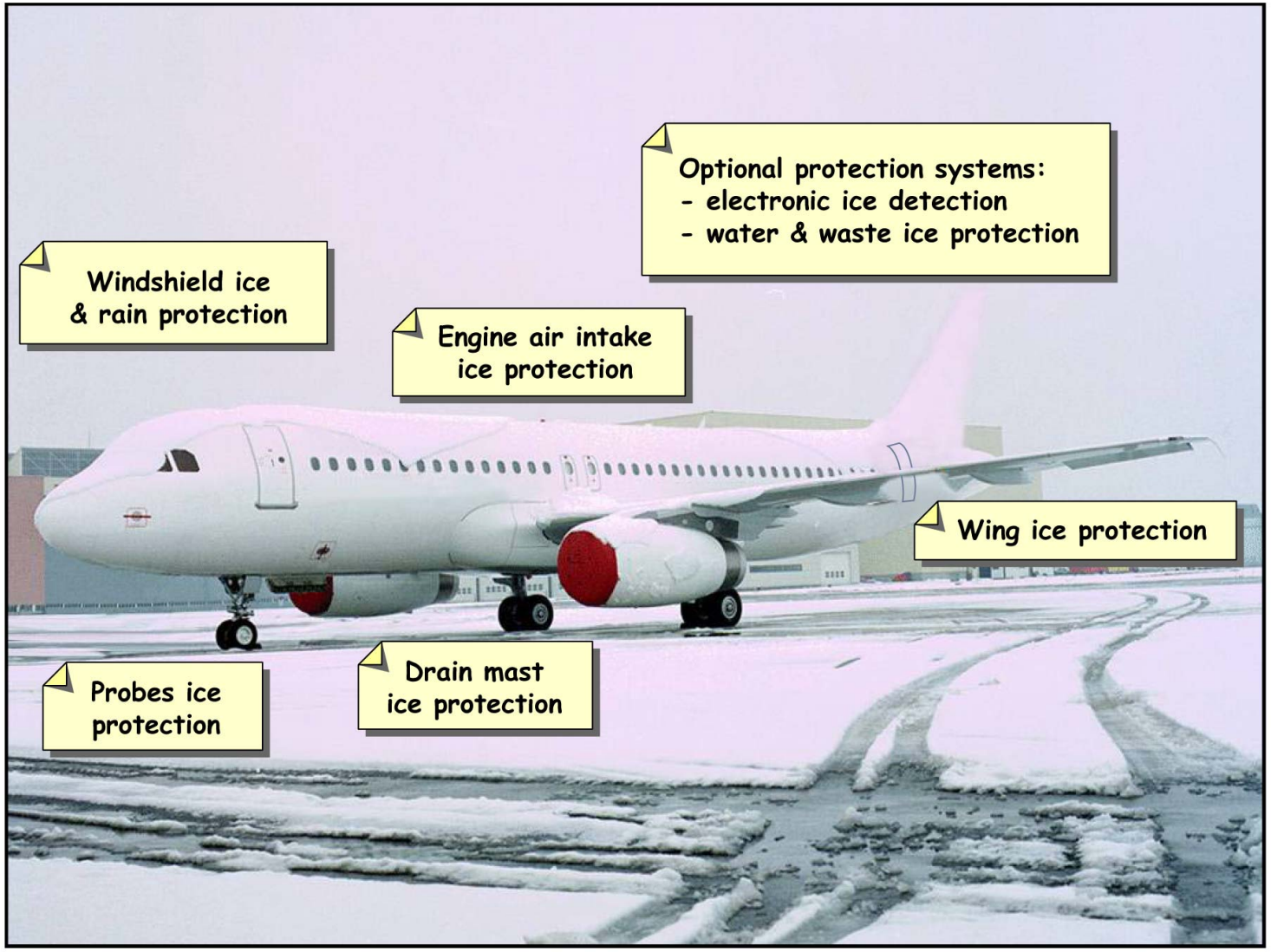
In order to provide reliable information for the air data systems, the air data probes are heated AUTOMATICALLY when at least one engine is running. Ice protection of the Angle Of Attack (AOA) sensors, pitot probes, static ports, and Total Air Temperature (TAT) probes is achieved by electrical heating. The PROBE/WINDOW HEAT pushbutton switch (normally in the AUTO position) may be used to select the probe heating ON with the engines shut down.

WINDSHIELD ANTI ICE PROTECTION

Electrical heating is provided for windshield anti-icing and cockpit side window de-fogging. The front windshields and side windows are heated AUTOMATICALLY when at least one engine is running. The PROBE/WINDOW HEAT pushbutton switch (normally in the AUTO position) may be used to select the window heating ON with the engines shut down.

DRAIN MAST ICE PROTECTION

When the electrical system is powered, the waste water Drain Masts are also electrically heated. The Drain Mast Heating is switched ON when the temperature is below a specific value. It is not always in operation. There are two Drain Masts located on the lower fuselage forward and aft sections. Two Control Units, located in the cargo compartments, control the Heating of the FWD and AFT Drain Masts.



SYSTEM OVERVIEW - WING ANTI ICE PROTECTION ... DRAIN MAST ICE PROTECTION

ICE AND RAIN PROTECTION SYSTEM COMPONENT LOCATION (2)

COMPONENT LOCATION

WING ICE PROTECTION

Two wing anti-ice control-valves are installed on the aircraft, one in each wing leading-edge outboard of the engine pylons.

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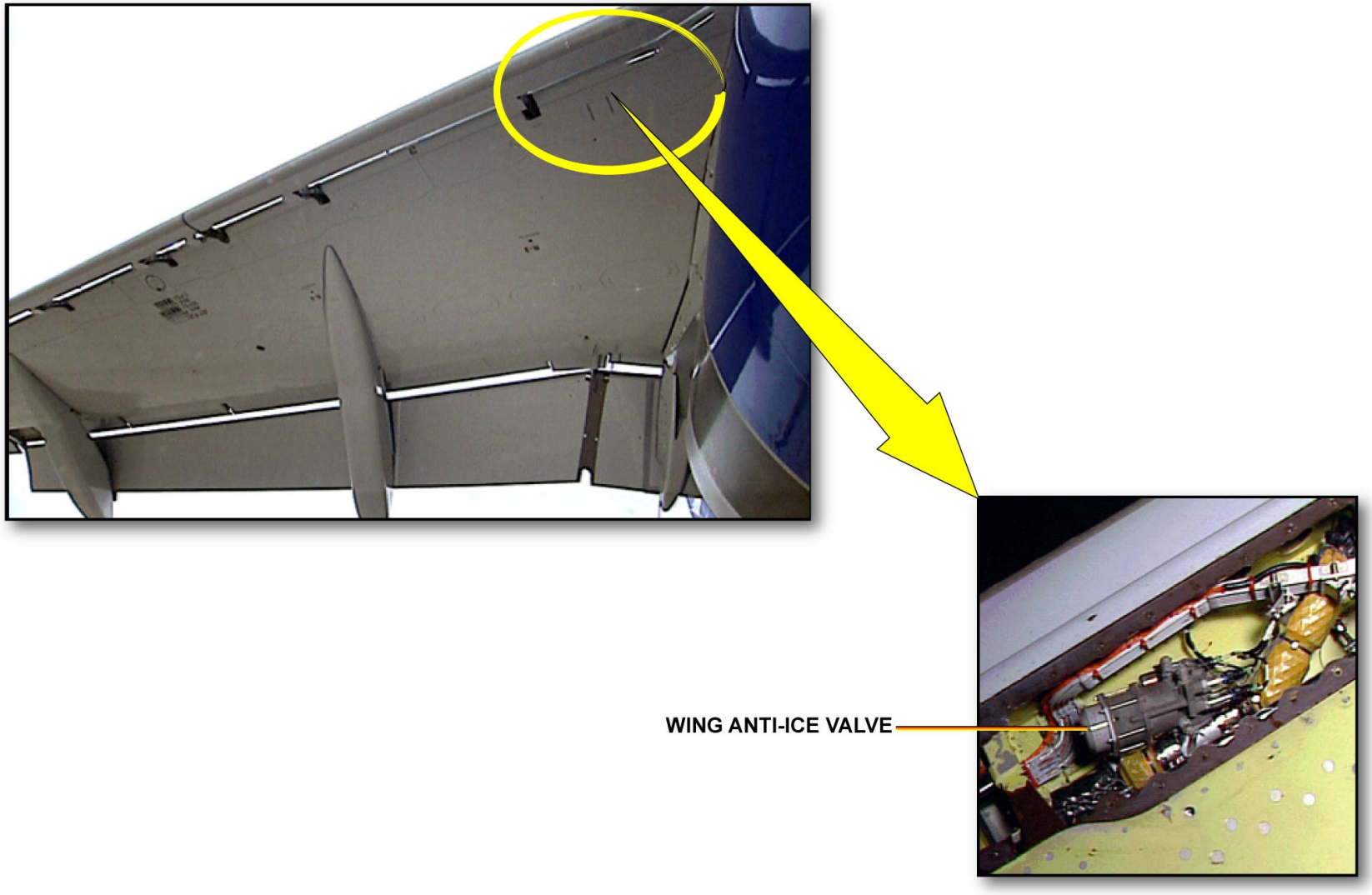

COMPONENT LOCATION - WING ICE PROTECTION

ICE AND RAIN PROTECTION SYSTEM COMPONENT LOCATION (2)

COMPONENT LOCATION (continued)

ENGINE AIR INTAKE ICE PROTECTION

The engine anti-ice valve is installed on the lower right hand side of the engine.

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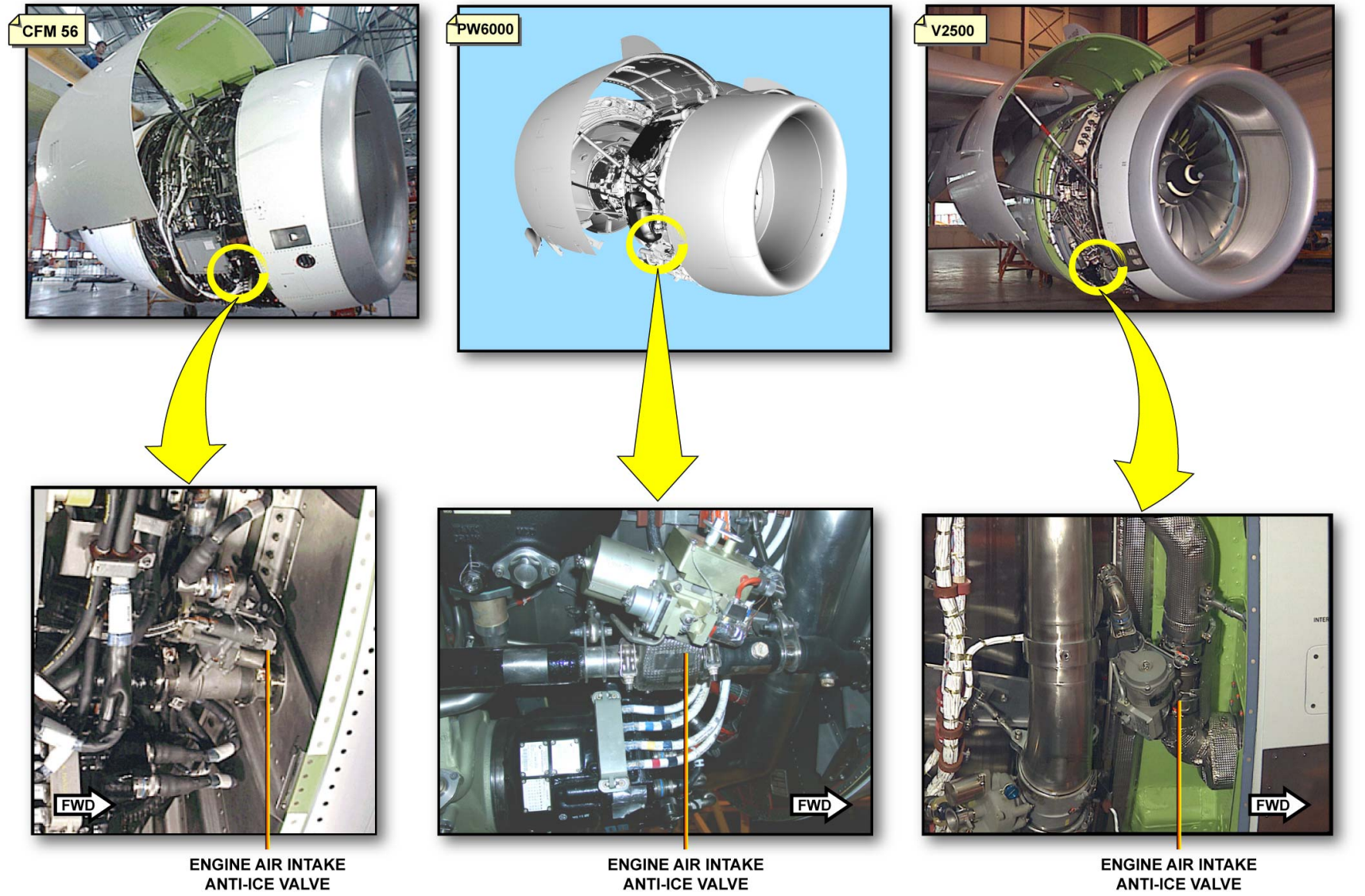

COMPONENT LOCATION - ENGINE AIR INTAKE ICE PROTECTION

ICE & RAIN PROTECTION SYSTEM CONTROL & INDICATING (2)

LOCATE CONTROL/INDICATING IN COCKPIT

WING ANTI-ICE TEST

ENGINE ANTI-ICE FAULT

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SYSTEM PRESENTATION (2)

SOURCES

The air for wing anti-icing is supplied by the pneumatic system.

VALVES

Hot air from the pneumatic system is supplied to each wing by an electrically controlled, pneumatically operated anti-ice control valve. The anti-ice control valves regulate the anti-icing pressure to approximately 23 psi. The valves also include high and low pressure switches to monitor the regulation function of the valve. In case of electrical failure or lack of pneumatic supply pressure, the valve closes.

CONTROLS

The wing anti-ice control valves are controlled from the cockpit by the WING Anti-Ice P/B. On the ground for test functions, a time-delay relay limits the opening of the valve to 30 seconds when the pushbutton switch is selected ON.

DUCTS

Air reaches slat 3 through a telescopic duct. It is distributed to the outboard slats by piccolo ducts, interconnected by flexible connections. A restrictor located downstream from the control valve adjusts the airflow. It also limits the flow in case of rupture of a distribution duct.

USERS

Only the three outboard slats are protected by the hot anti-icing air. Due to the aerodynamic characteristics of the wing, slats 1 and 2 do not need to be protected.

PRESSURE SWITCH

The two pressure switches monitor the pressure downstream of the butterfly valve to sense a valve malfunction. If the pressure increases to 2.1 bar (30.5 psi) the related switch gives a "high pressure " signal. If the pressure decreases to 1.0 bar (14.5 psi) the related switch gives a "low pressure" signal.

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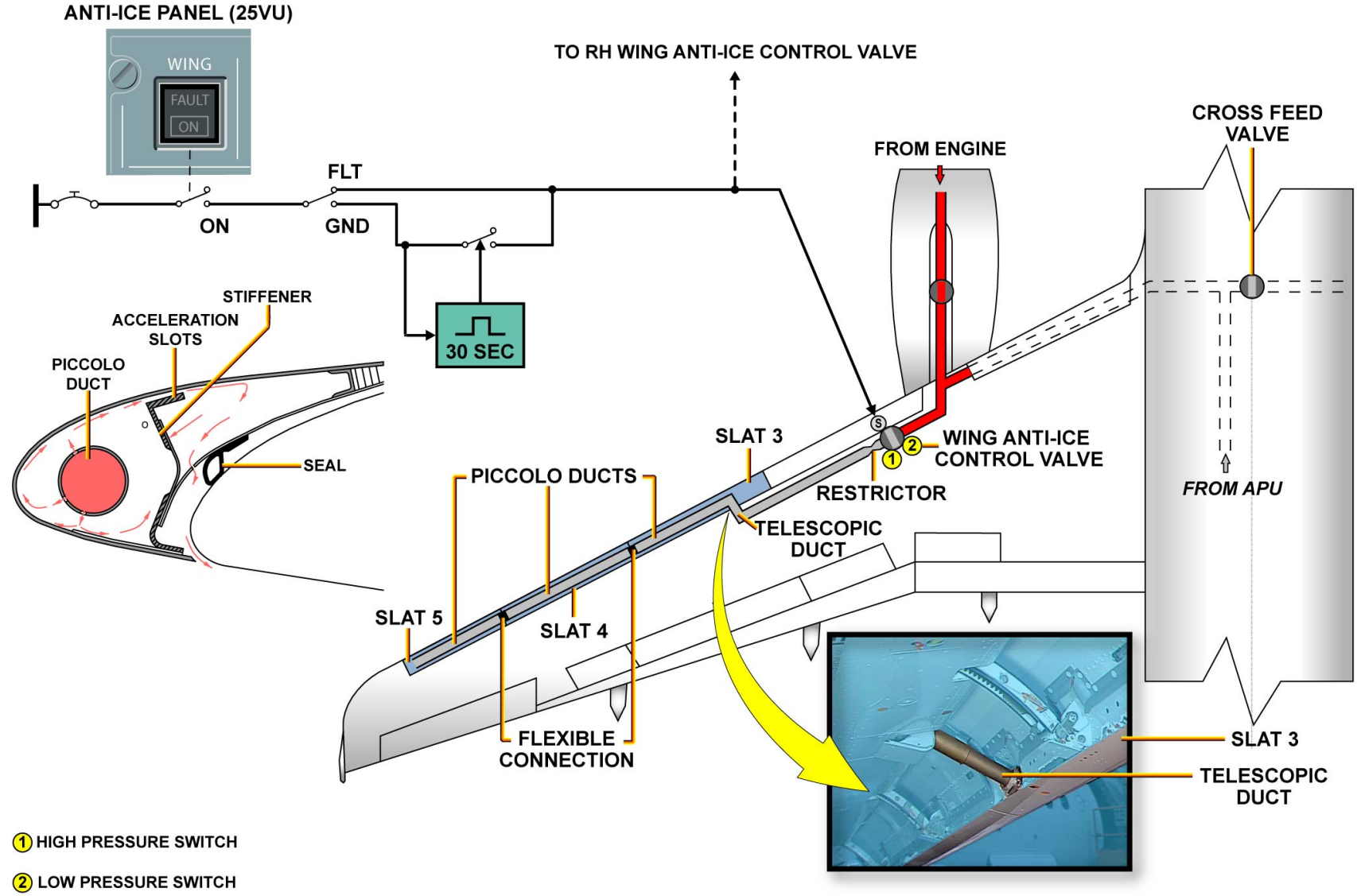

SOURCES ... PRESSURE SWITCH

SYSTEM INTERFACES (3)

P/BSW

The Wing Anti-Ice (WAI) P/BSW lets the WAI system be activated either during flight operation or during ground test operation for a limited time. It also sends the P/BSW configuration to the System Data Acquisition Concentrators (SDACs) and to the Engine Interface Units (EIUs). The WAI P/BSW acquires a discrete signal from the fault relay for the illumination of the FAULT light, during either valves transit or in case of disagreement between valves position and system selection or in case of LP detection.

EIU

The EIUs acquire system selection for engine power increase according to the bleed demand.

LGCIU

The Landing Gear Control and Interface Units (LGCIUs) send a shock absorber extended signal to the control relay to enable the system to be controlled when the A/C is in flight configuration.

SDAC

The SDACs acquire discrete inputs to display the system status on the ECAM warning page, ECAM MEMO page and ECAM BLEED page.

ACSC

The Air Conditioning System Controller (ACSC) 1 and 2 are interfacing with signals from the wing ice protection system. The ACSC acquires discrete inputs, to monitor the system and manage the bleed air. It stores failure data of the WAI system.

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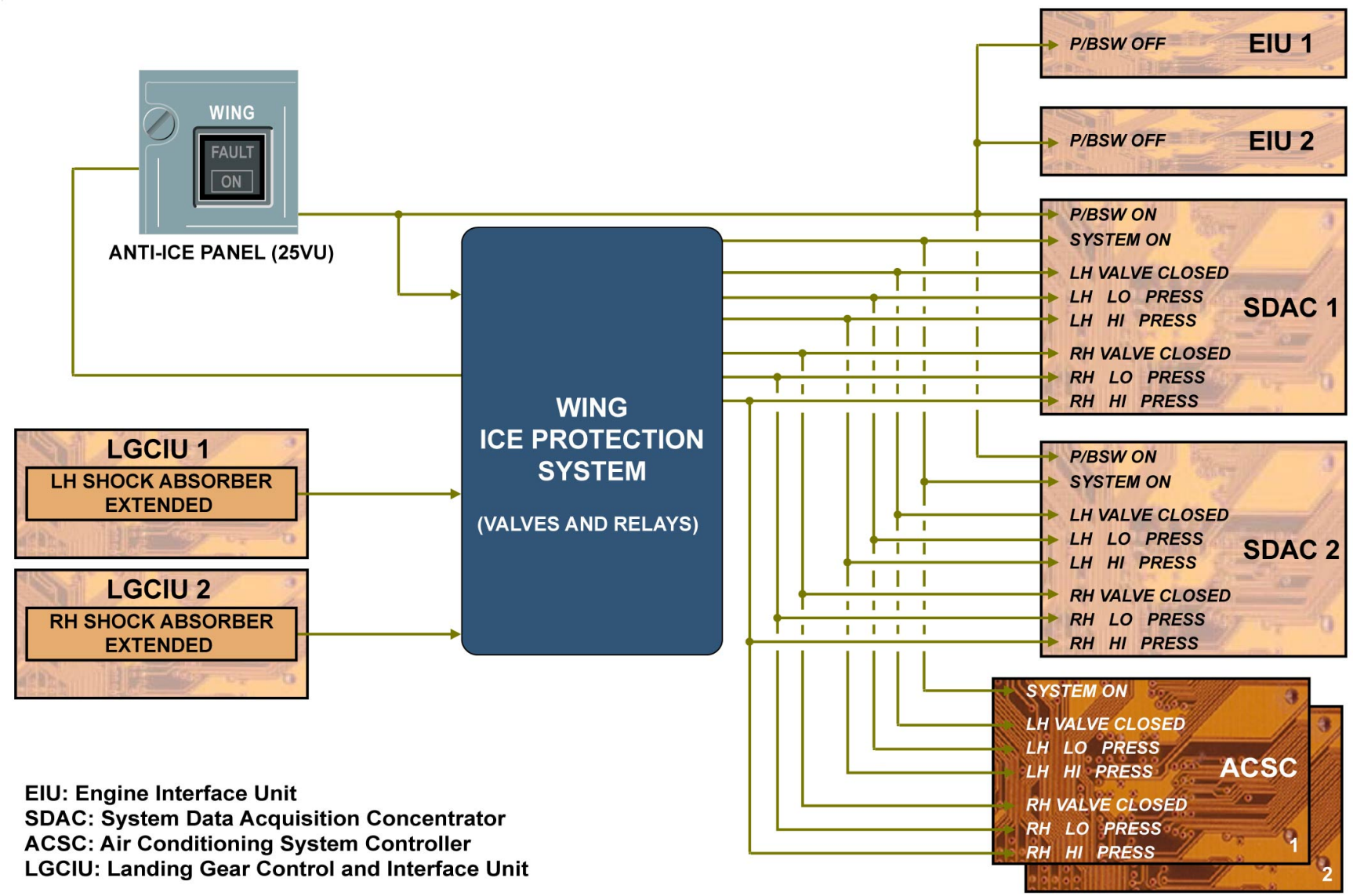
WING
FAULT
ON
ANTI-ICE PANEL (25VU)
LGCIU 1
LH SHOCK ABSORBER EXTENDED
LGCIU 2
RH SHOCK ABSORBER EXTENDED
WING ICE PROTECTION SYSTEM
(VALVES AND RELAYS)
P/BSW OFF
EIU 1
P/BSW OFF
EIU 2
P/BSW ON
SYSTEM ON
LH VALVE CLOSED
LH LO PRESS
LH HI PRESS
RH VALVE CLOSED
RH LO PRESS
RH HI PRESS
SDAC 1
P/BSW ON
SYSTEM ON
LH VALVE CLOSED
LH LO PRESS
LH HI PRESS
RH VALVE CLOSED
RH LO PRESS
RH HI PRESS
SDAC 2
SYSTEM ON
LH VALVE CLOSED
LH LO PRESS
LH HI PRESS
RH VALVE CLOSED
RH LO PRESS
RH HI PRESS
ACSC
1
2
EIU: Engine Interface Unit
SDAC: System Data Acquisition Concentrator
ACSC: Air Conditioning System Controller
LGCIU: Landing Gear Control and Interface Unit

P/BSW ... ACSC

SYSTEM PRESENTATION (2)

USERS

The engine air intake is protected by its related bleed air, which heats the inlet leading edge in icing conditions. The hot air is then discharged overboard.

SOURCE

Hot air for the engine anti-ice system is supplied by a dedicated HP Compressor (HPC) bleed:

- on the V2500, 7th stage,
- on the CFM-56, 5th stage,
- on the PW6000, 9th stage.

The nacelle installed on CFM56 TECH INSERTION:
The modified Nacelle Anti-Icing (NAI) supply duct with the restrictor is required because of the new HPC higher air pressure and temperature at the 5th stage customer bleed ports. It complies with the certification requirement in case of duct rupture or failure occurring in the area of the NAI bleed air supply.

VALVE

The engine anti-ice system supply is controlled by an electrically controlled, pneumatically operated anti-ice valve. The solenoid is energized to CLOSE the valve, so in case of loss of electrical power supply, the valve will go fully open provided the engine bleed air supply pressure is high enough. In the absence of air pressure, the valve is spring-loaded to the closed position.

NOTE: Note: The anti-ice valve of the CFM-56 engine uses an external 9th stage muscle supply to open the valve.

CONTROLS

For each engine, the anti-ice valve is controlled by a P/BSW located on the ANTI ICE section of the overhead panel. When the engine Anti-ice (A.ICE) valve is open, a signal is sent to the Air Conditioning System Controller (ACSC), which calculates the bleed air demand and sends the signal tothe Full Authority Digital Engine Control (FADEC) via the Engine Interface Unit (EIU). The additional bleed demand decreases the maximum N1 for the CFM56 and PW6000 and the maximum Engine Pressure Ratio (EPR) limit for the V2500 relative to the ambient conditions and the engine operating conditions.

ECAM PAGE

If at least one of the two engine air intake anti-ice protection systems is selected ON, a message appears in green on the upper ECAM MEMO display.
The signal received by EIU is used to avoid an unwanted anti ice fault ECAM warning on ground, when the engine is not running.

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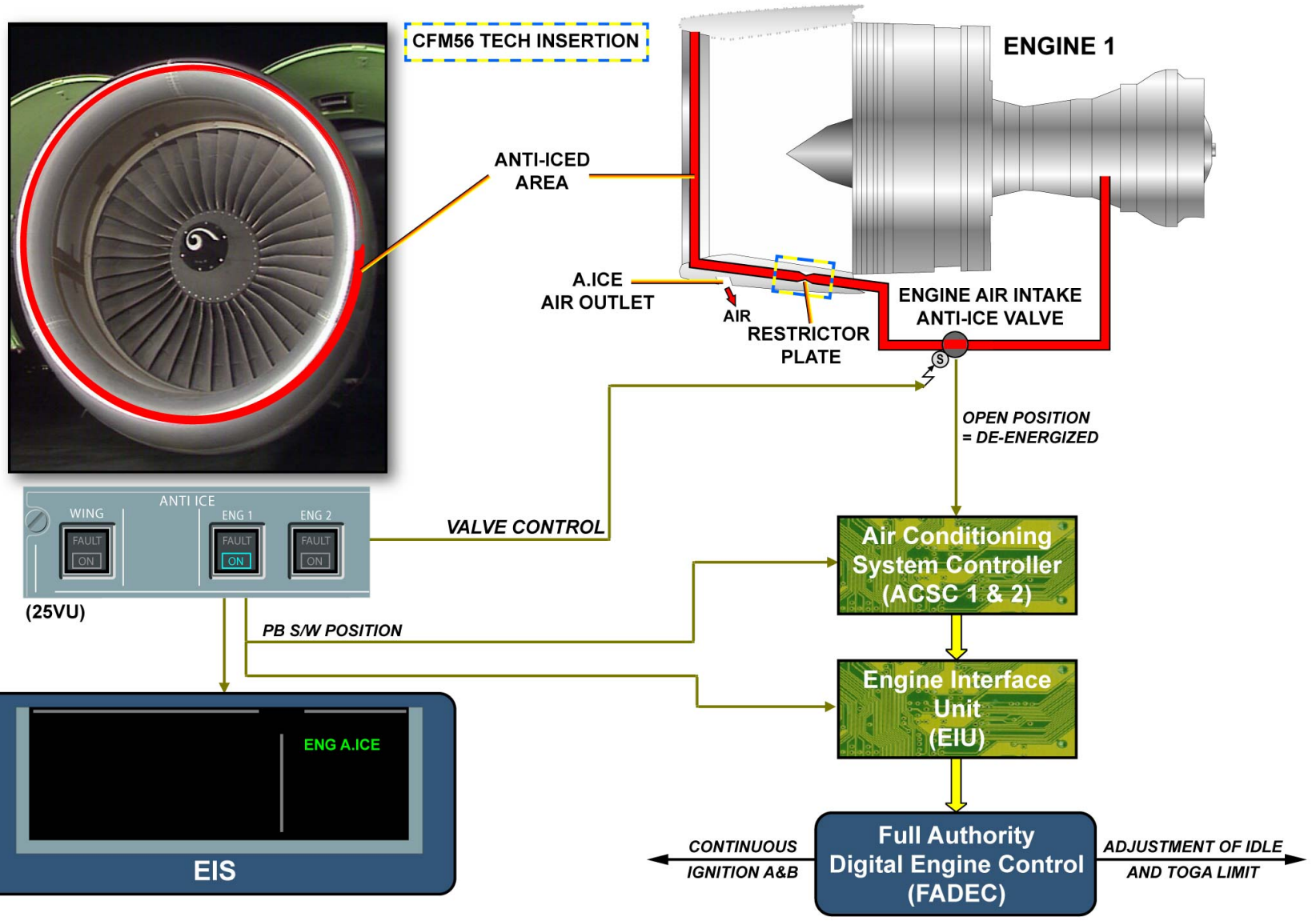

USERS ... ECAM PAGE

SYSTEM INTERFACES (3)

P/BSW

The P/BSW sends a discrete signal to the solenoid to open or close the valve, this information is also sent to the System Data Acquisition Concentrators (SDAC). The "FAULT" light comes on either during valve transit or in case of disagreement between valve position and system selection.

SDAC

The SDAC acquire the P/BSW configuration and the "FAULT" condition information to display system status on the ECAM warning page and ECAM MEMO page.

ACSC

The Air Conditioning System Controller (ACSC) 1 is responsible for the bleed management when the engine Anti Ice (A.ICE) system is switched ON. ACSC acquires the "valve not closed" position information from the valve position switch for bleed air management.

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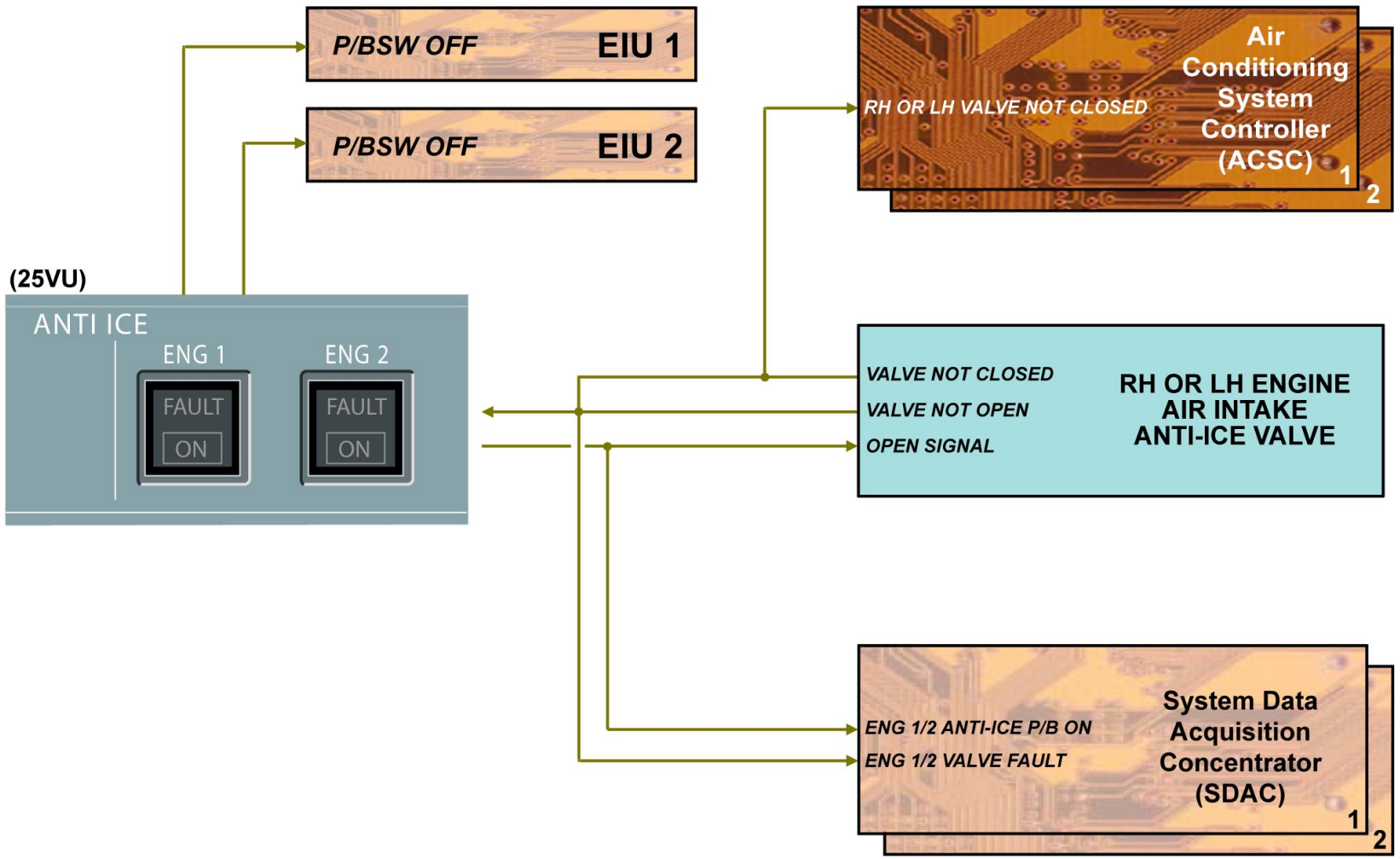
P/BSW OFF
EIU 1
P/BSW OFF
EIU 2
(25VU)
ANTI ICE
ENG 1
ENG 2
FAULT
ON
FAULT
ON
RH OR LH VALVE NOT CLOSED
Air Conditioning System Controller (ACSC)
1
2
VALVE NOT CLOSED
VALVE NOT OPEN
OPEN SIGNAL
RH OR LH ENGINE AIR INTAKE ANTI-ICE VALVE
ENG 1/2 ANTI-ICE P/B ON
ENG 1/2 VALVE FAULT
System Data Acquisition Concentrator (SDAC)
1
2

P/BSW ... ACSC

SYSTEM PRESENTATION (2)

FUNCTION

The static ports, Angle-Of-Attack (AOA), pitot and Total Air Temperature (TAT) probes are electrically heated to prevent ice formation. The CAPT, F/O and STBY systems are independent. Each one includes a Probe Heat Computer (PHC), which controls probe and static ports heating. As there are only 2 TAT probes, the first one on the CAPT and the second one on the F/O, PHC 3 is not linked to a TAT probe.

CONTROL

The probes and static ports heating come on automatically when at least one engine is running. It can also be manually activated by the PROBE/WINDOW HEAT P/B. On ground, pitot heating is reduced and TAT heating is cut off, the Landing Gear Control and Interface Units (LGCIUs) control both. The Probe Heating System is also switched ON automatically when the LCGIU sends a FLIGHT signal.

PHC

Heating monitoring and fault indication is given by the related PHC. A probe or a sensor heating failure is sent to the ECAM via an Air Data/Inertial Reference Unit (ADIRU) and the Flight Warning Computers (FWC). The PHC also transmits fault messages to the Centralized Fault Display Interface Unit (CFDIU).

CAUTION

Pulling the PHC or Engine Interface Unit (EIU) power supply C/Bs causes unwanted heating of the probes and static ports. The system is also switched ON when the C/B of the LGCIU 1 and 2 is pulled (Flight signal).

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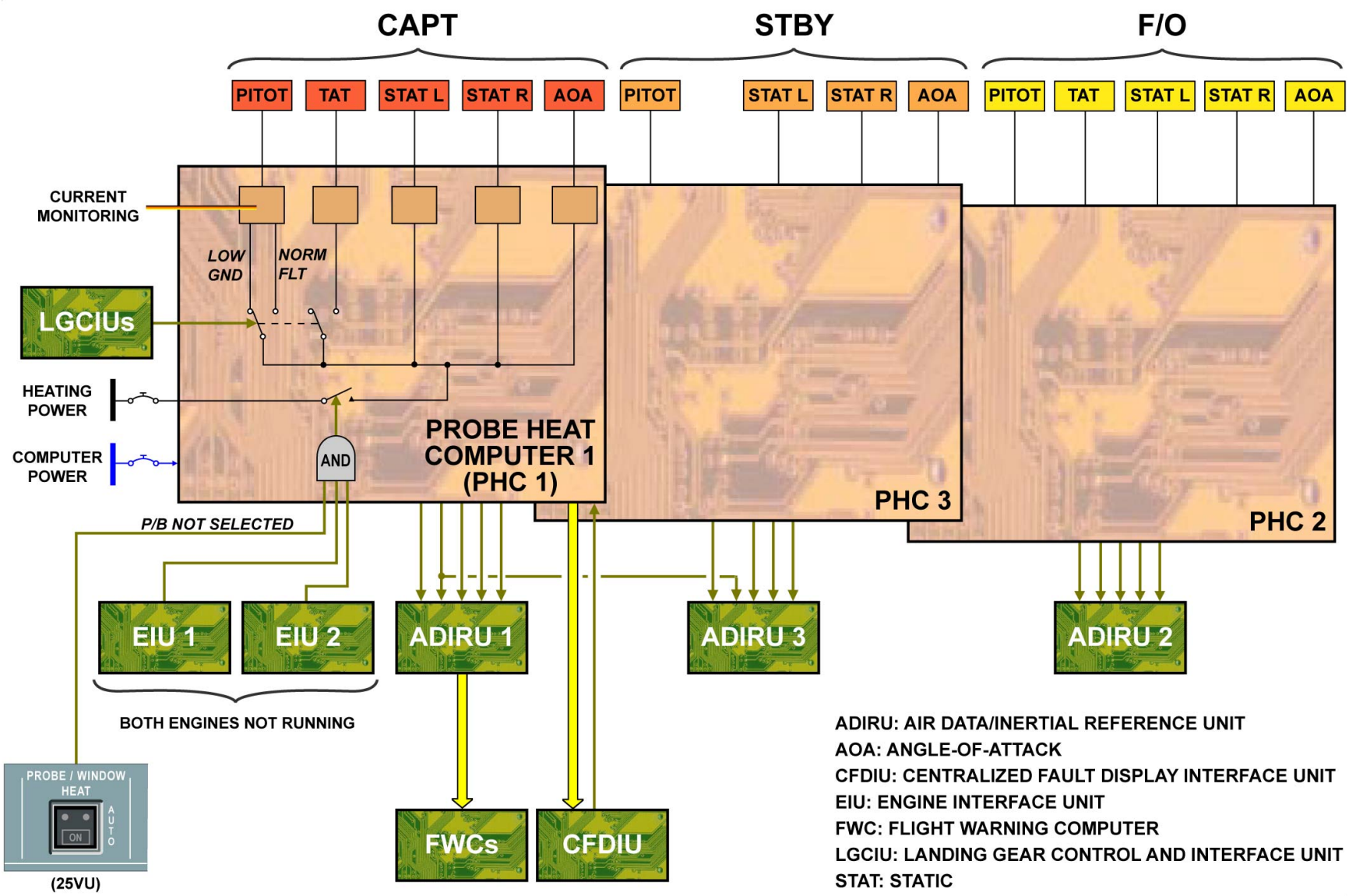

FUNCTION ... CAUTION

SYSTEM DESCRIPTION/OPERATION (3)

GENERAL

This typical probe heat schematic shows an A/C on ground, electrically supplied, with the system "off". Remember that the standby probe heat system has no Total Air Temperature (TAT) heating.

ADIRU

In case of a probe-heating fault the PHC sends a discrete output to its respective Air Data/Inertial Reference Unit (ADIRU), which in turn transmits the failure to the Flight Warning Computers (FWC).

CFDIU

The Centralized Fault Display Interface Unit (CFDIU) is connected to the PHC for fault system transmission. The PHC is a type 2 system: ARINC 429 output and maintenance test discrete input.

ENGINE RELAYS

The Engine Interface Unit (EIU) energizes the oil low-pressure and ground relays, when the related engine is not running.

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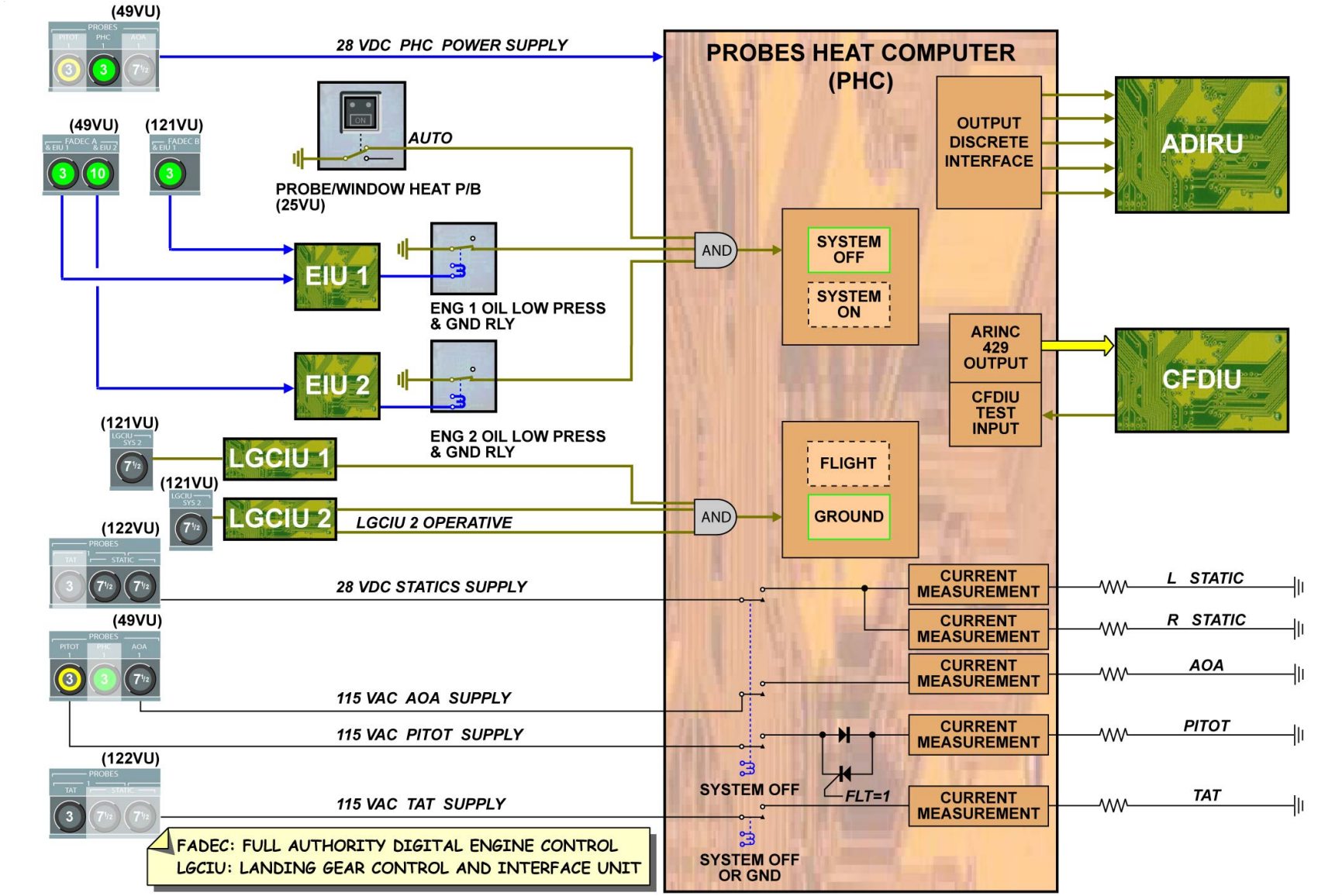

GENERAL ... ENGINE RELAYS

SYSTEM DESCRIPTION/OPERATION (3)

CONTROL

Probes and static ports heating come on automatically when at least one engine is running. It can also be activated by the PROBE/WINDOW HEAT P/B. On ground, pitot heating is reduced and TAT heating is cut off.

LGCIU

When one of the three control conditions is met, the flight condition enables heating of the TAT sensor and full wave heating of the pitot probe.

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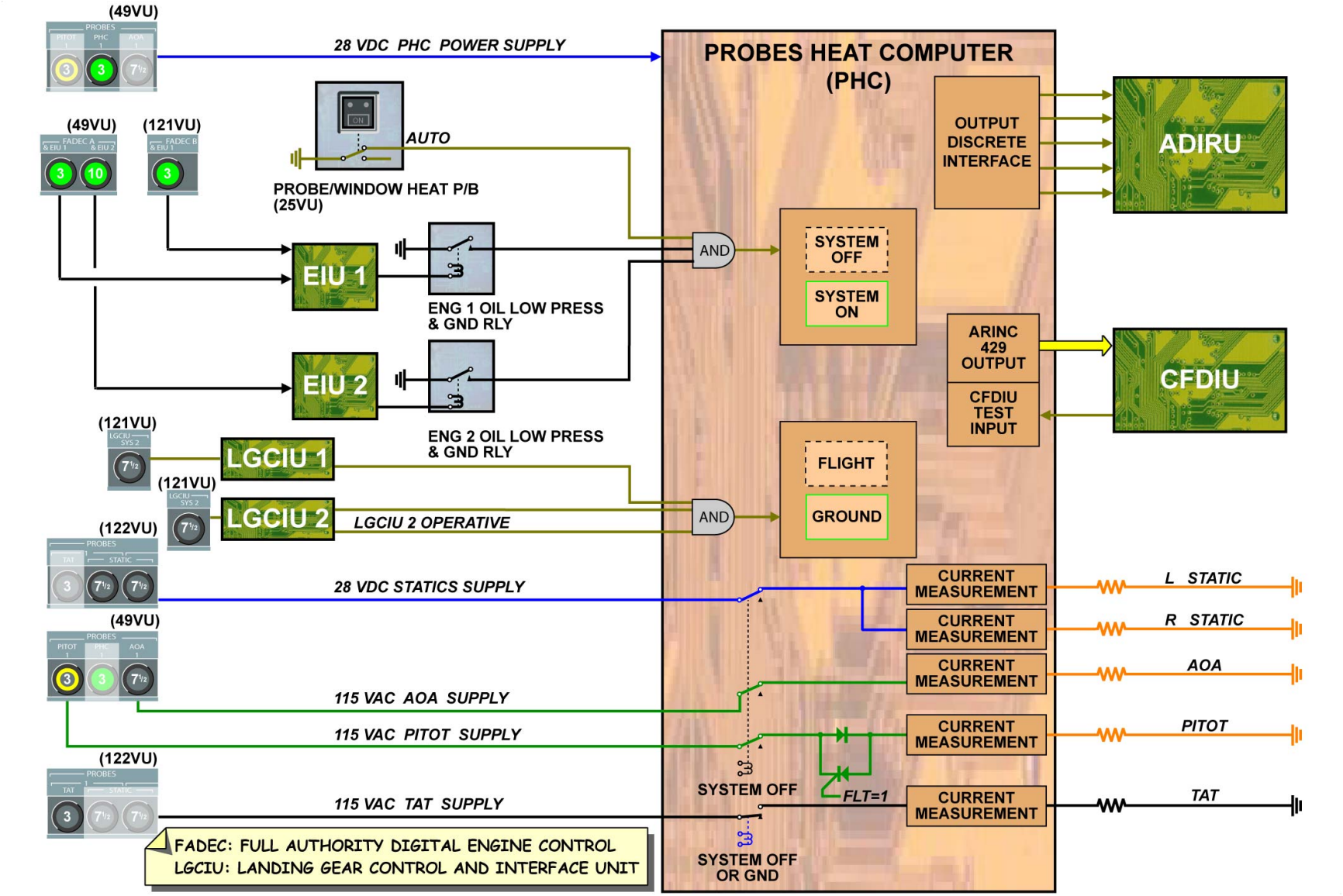


CONTROL & LGCIU

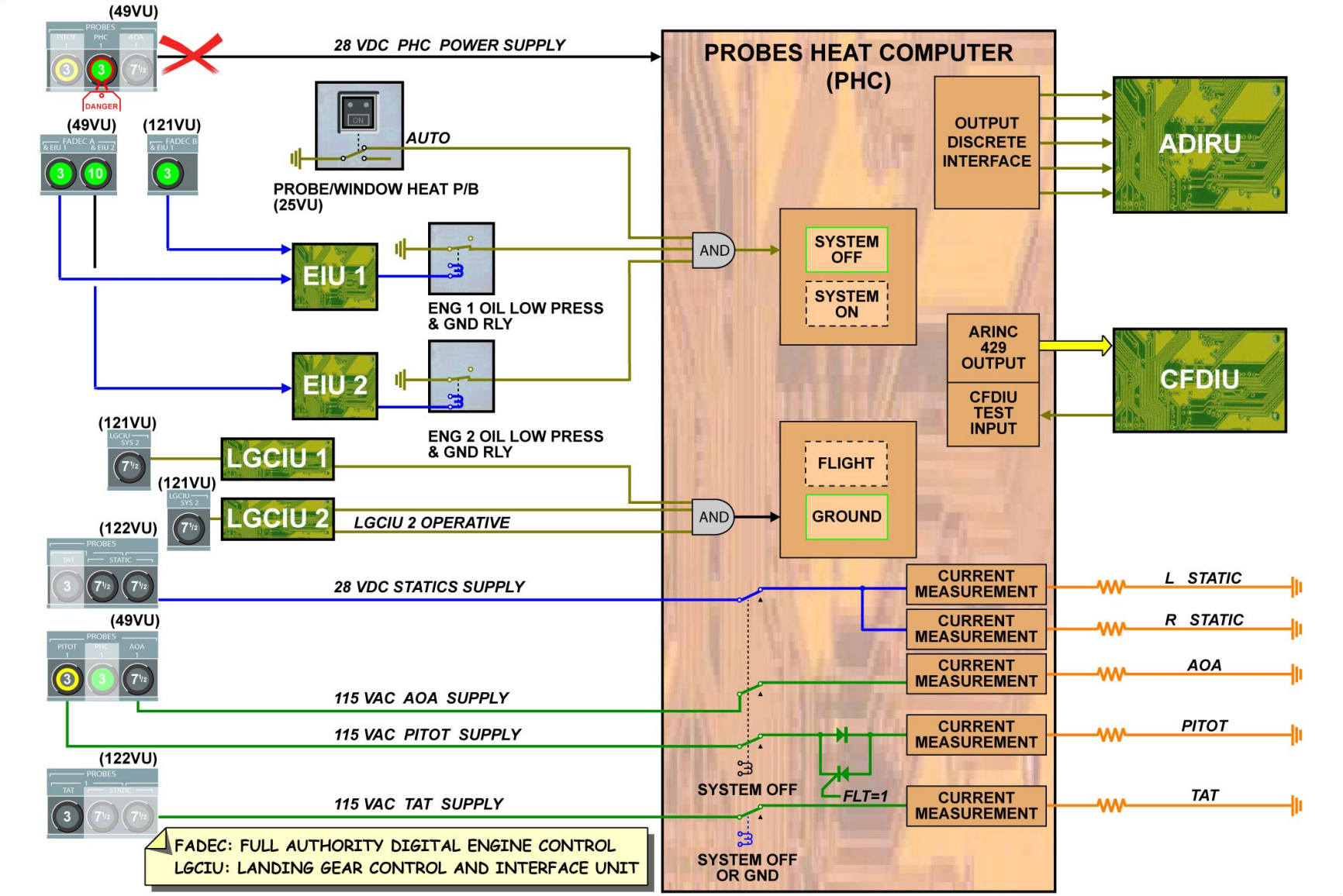
SYSTEM DESCRIPTION/OPERATION (3)

POWER SUPPLY

The Probe Heat Computer (PHC) is supplied with 28 VDC. The static ports are supplied with 28 VDC; the Angle-Of-Attack (AOA) sensor, TAT sensor and pitot probe are supplied with 115 VAC.

CAUTION FOR PHC C/B OPENED

If you pull the PHC power supplied C/B, the related probes and static ports will be fully heated.



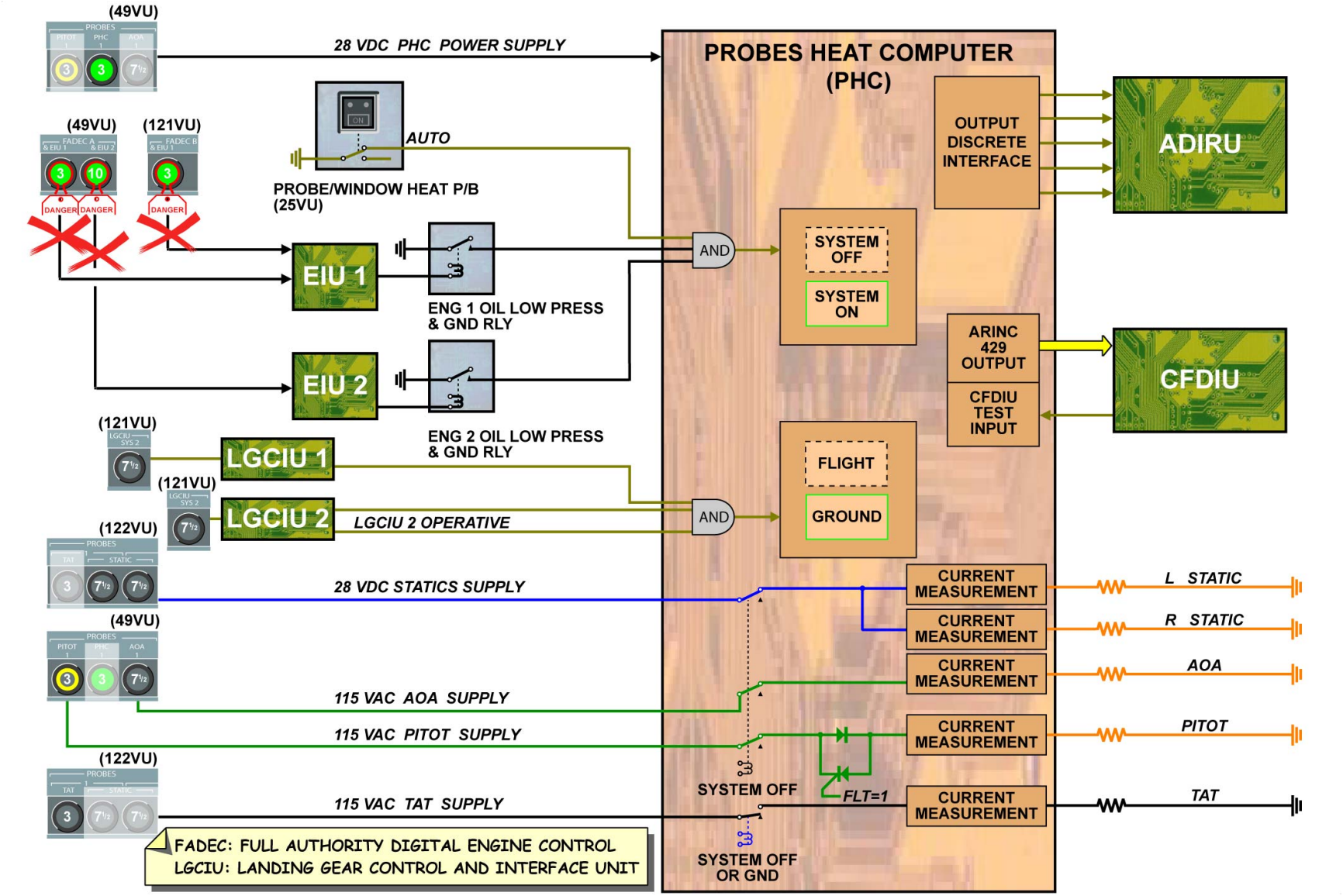
POWER SUPPLY - CAUTION FOR PHC C/B OPENED

SYSTEM DESCRIPTION/OPERATION (3)

POWER SUPPLY (continued)

CAUTION FOR EIU C/B OPENED

If you pull the EIU power supplied C/B, the related engine oil low-pressure and ground relays are de-energized, the AOA probes and static ports will be heated and as the aircraft is on ground, the Pitot probes receive low heating only and the TAT sensor heating is inhibited.



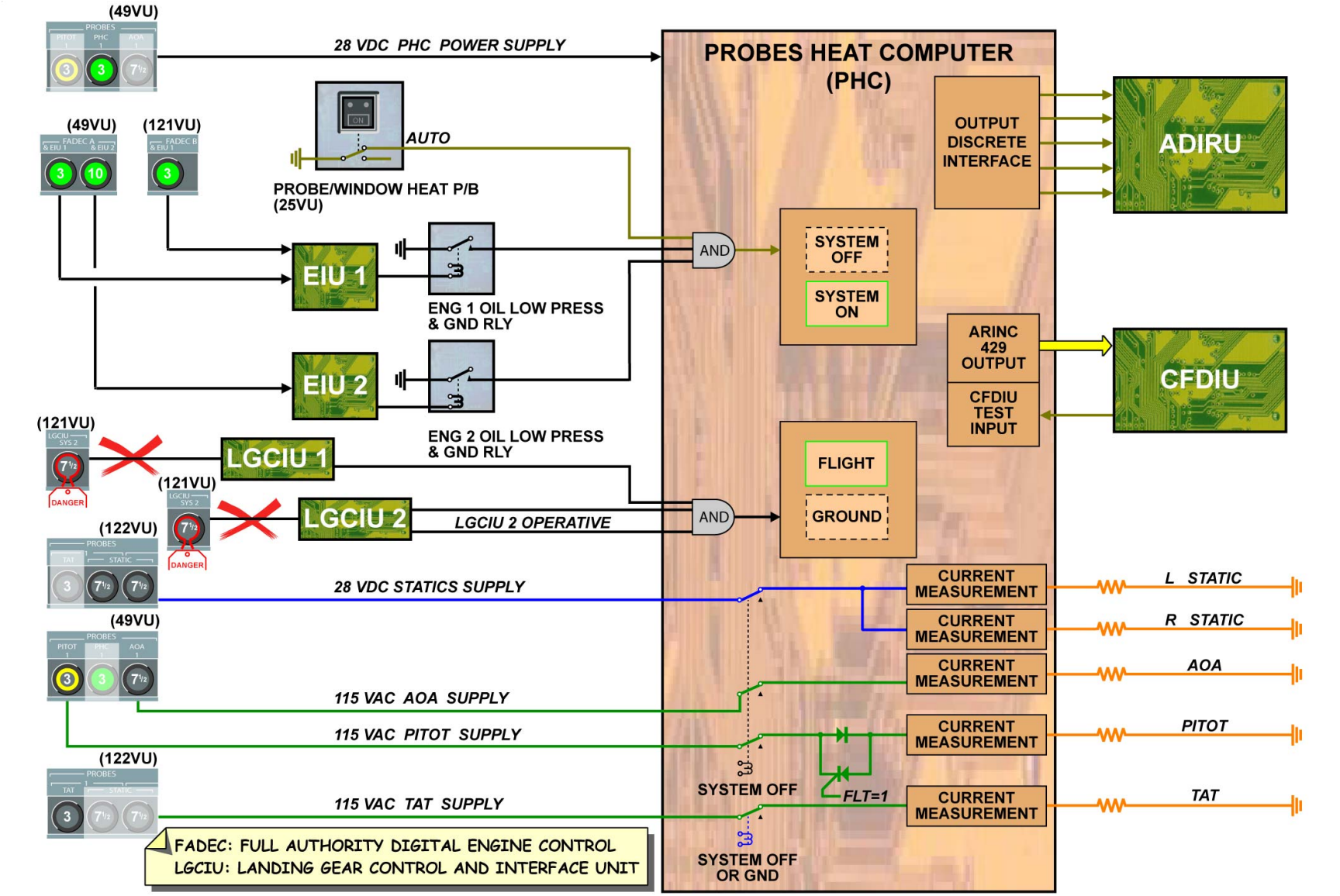
POWER SUPPLY - CAUTION FOR EIU C/B OPENED

SYSTEM DESCRIPTION/OPERATION (3)

POWER SUPPLY (continued)

CAUTION FOR LGCIU C/B OPENED

If you pull the LGCIU power supplied C/B, the related probes and static ports will be fully heated.



POWER SUPPLY - CAUTION FOR LGCIU C/B OPENED

SYSTEM PRESENTATION (2)

FUNCTION

Windshields and side windows are electrically heated to maintain clear visibility in icing or misting conditions. The system is made up of two independent systems. Each one includes one Window Heat Computer (WHC), one windshield and two windows, one fixed and one sliding.

CONTROL

Windshield and windows heating comes on automatically when at least one engine is running. It can also be manually activated by the PROBE/WINDOW HEAT P/B. The windshield heating operates at low power on the ground and high power in flight.

WHC

Temperature regulation, overheat protection and fault indication are given by each WHC. In case of a windshield or window heating fault, the WHC sends an output signal to the ECAM via the System Data Acquisition Concentrator (SDAC). The WHCs also transmit fault messages to the Centralized Fault Display Interface Unit (CFDIU).

CAUTION

CAUTION: Pulling the Engine Interface Unit (EIU) power supply C/Bs causes the unwanted heating of the windshield and the side windows.
If you have to pull the Landing Gear Control and Interface Unit (LGCIU) power supply C/Bs or before you lift the aircraft on jacks you have to accomplish the Flight Configuration Precautions, this prevents unwanted heating of the windshield and side windows.

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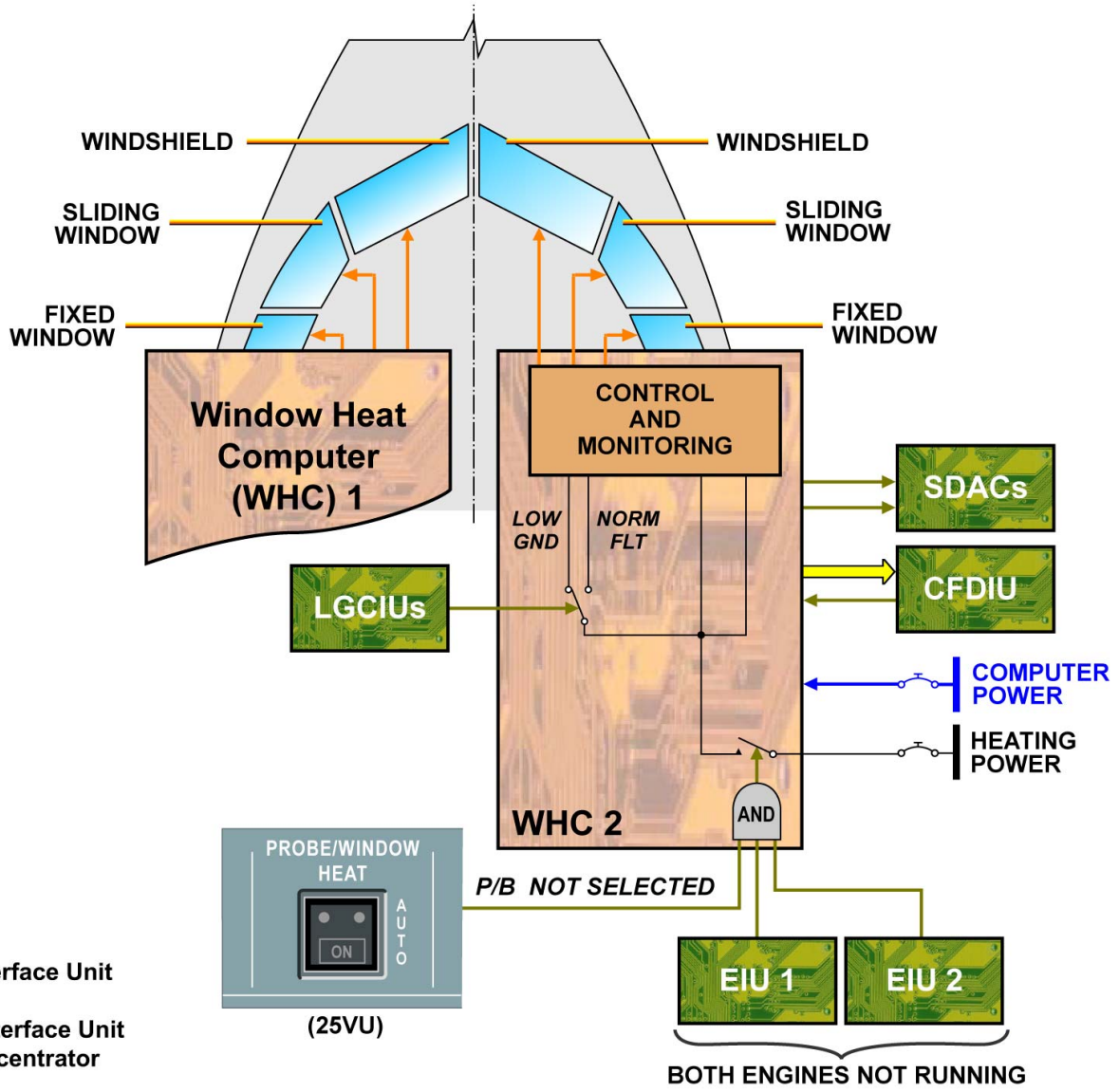

CFDIU: Centralized Fault Display Interface Unit
EIU: Engine Interface Unit
LGCIU: Landing Gear Control and Interface Unit
SDAC: System Data Acquisition Concentrator

FUNCTION ... CAUTION

SYSTEM DESCRIPTION/OPERATION (3)

GENERAL

The window and windshield anti-icing and demisting system is designed to maintain clear visibility through the cockpit front and side windows in icing or misting conditions. Windshields are de-iced, sliding and fixed windows are demisted.

SYSTEM DESCRIPTION

The Window Heat Computer (WHC) is supplied with 28 VDC. The fixed and sliding side windows are supplied with 115 VAC and the windshield is supplied with 200 VAC (dual phase 115 V AC).

CONTROL

The heating is cut off, when the three ground signals are sent to the AND logic. The windshield and windows are heated either when one engine is running (AUTO) or when the PROBE/WINDOW HEAT P/B is set to ON.

COMPUTER

WHC 1 controls and monitors the left hand side of the system and WHC 2 controls and monitors the right hand side. The WHC identifies and memorizes the faulty component. It also incorporates protection against over voltage due to lightning strike or static electricity on the windows. The WHC supplies independent temperature regulation between 35 and 42°C (95 and 107.6°F). For safety: heating is cut off if temperature reaches +/-60°C (140 or -76°F).

USERS

Each window comprises a heating element and two single loop sensors; one of the two sensors is a spare. Each windshield has a heating element and three loop sensors; only one sensor can be connected at a time. If that sensor fails, the maintenance has to swap the connectors to the spare sensor! The third sensor is an option.

ENGINE RELAYS

Oil LOW PRESSure and GrouND ReLaYs are energized by the Engine Interface Unit (EIU), when the related engine is not running.

LGCIU

Landing Gear Control and Interface Units (LGCIUs) inputs are used for the two heating levels of the windshield. The power is reduced on ground. When flight configuration is detected, the windshield is fully heated by the dual phase current.

SDAC

The System Data Acquisition Concentrators (SDACs) receive two discrete inputs from each WHC, one for the windshield and one for both windows to tell the crew about a heating fault.

CFDIU

The Centralized Fault Display Interface Unit (CFDIU) is connected to the WHC for fault system transmission. The WHC is a type 2 system, with an ARINC 429 output and a maintenance test discrete input.

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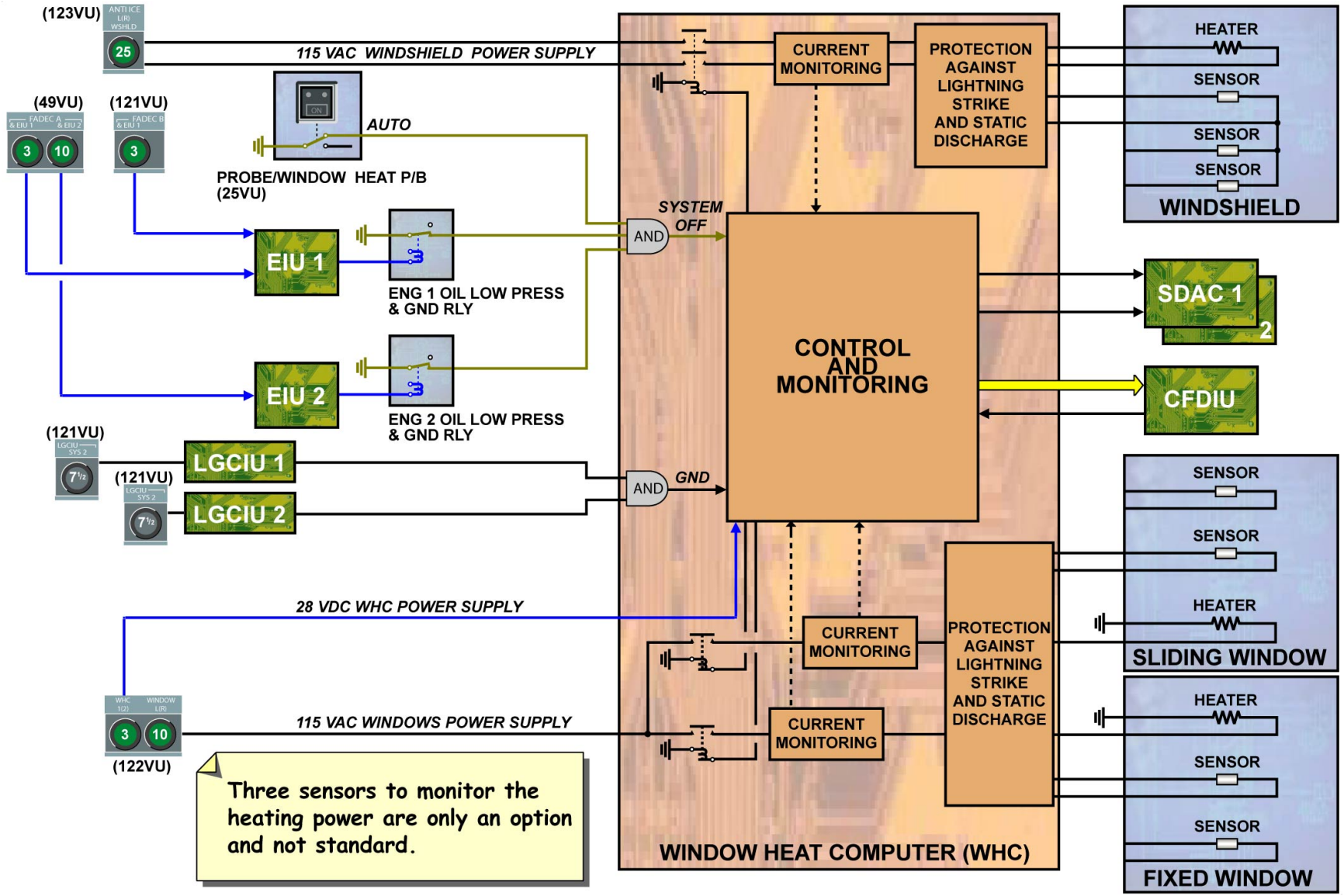

GENERAL & SYSTEM DESCRIPTION

SYSTEM DESCRIPTION/OPERATION (3)

SYSTEM OPERATION WHEN AIRCRAFT ON GROUND, ENGINES RUNNING

When the A/C is on ground, engines running, the LGCIUs send "ground" signal to WHC, which sends "low level heating" for the windshield.

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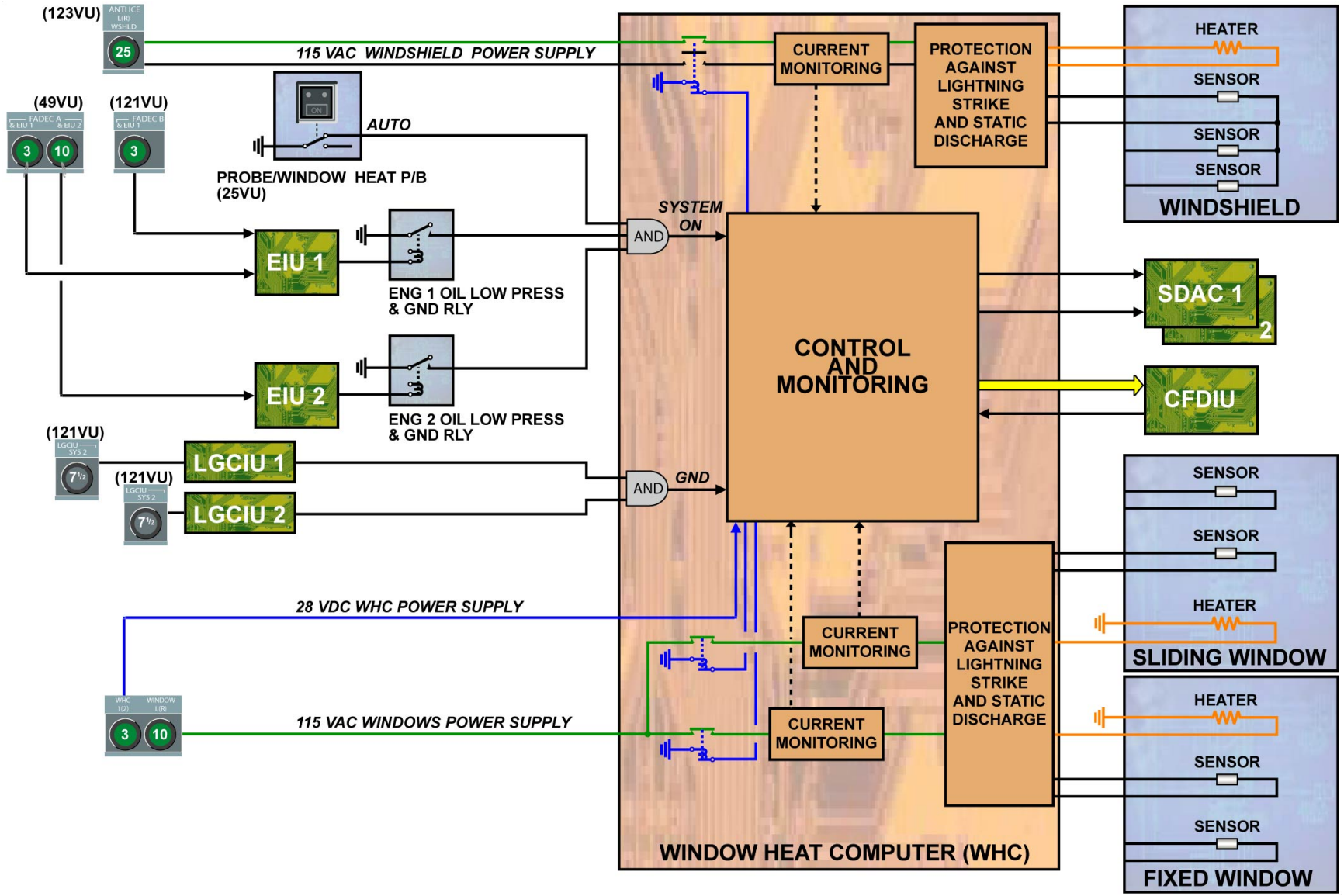


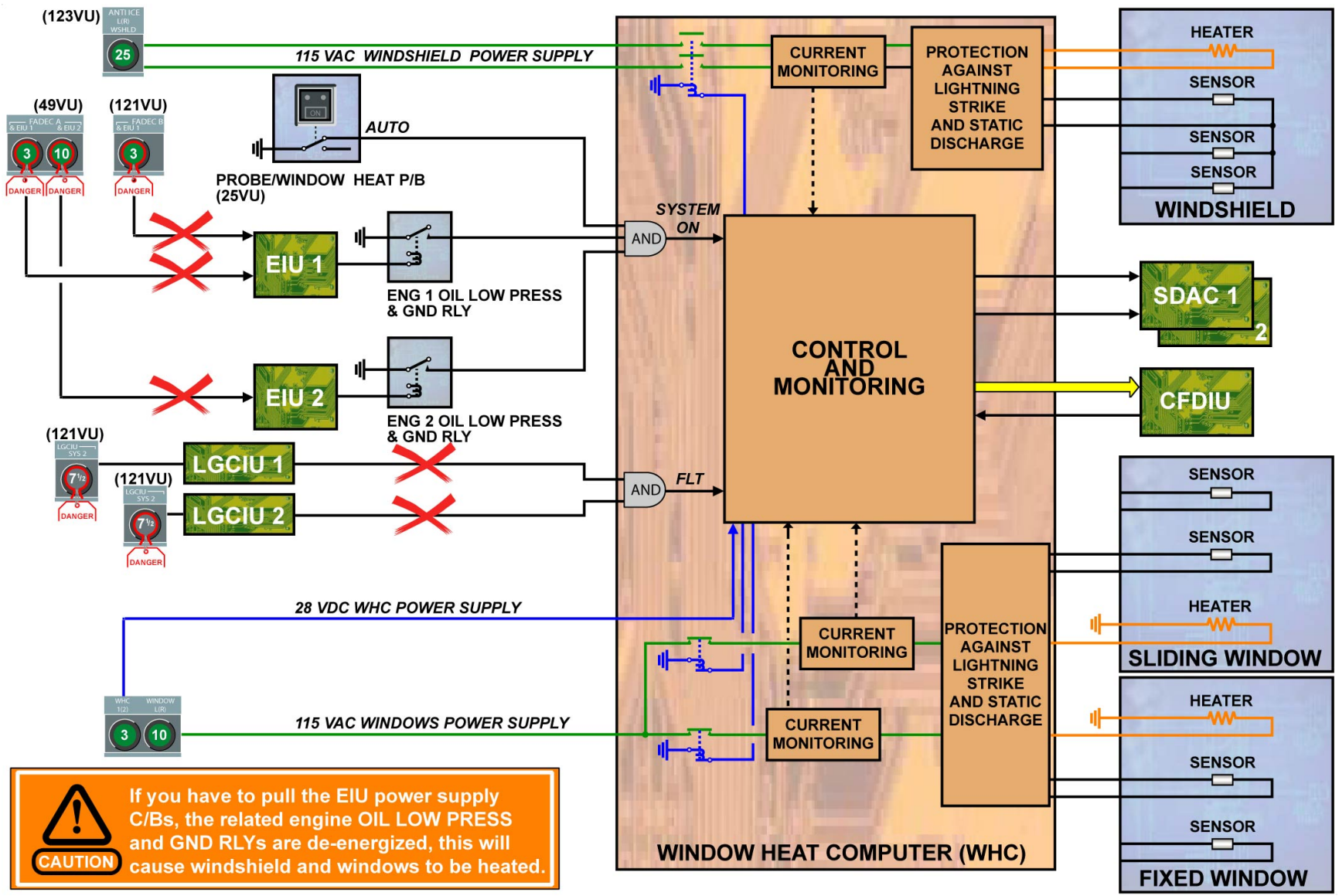
SYSTEM OPERATION WHEN AIRCRAFT ON GROUND, ENGINES RUNNING

UGB13131 - U7ST0M0 - UM30D2000000001

SYSTEM DESCRIPTION/OPERATION (3)

MAINTENANCE

CAUTION: If you have to pull the EIU power supply C/Bs, the related engine OIL LOW PRESS and GND RLYs are de-energized, this will cause windshield and windows to be heated.



MAINTENANCE

ICE & RAIN PROTECTION SYSTEM OPERATION, CONTROL & INDICATING (3)

ENGINE ANTI-ICE NORMAL OPERATION

PROBE/WINDOWS HEAT & FAULT

UGB13131 - U7ST0M0 - UM30IZLEVEL0302

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RAIN REPELLENT SYSTEM PRESENTATION (2)

FUNCTION

In heavy rain conditions, a rain repellent liquid, stored in a pressurized bottle, may be sprayed on the windshield to improve visibility. The spray nozzles are permanently purged by air from cabin hot air supply.

CONTROL

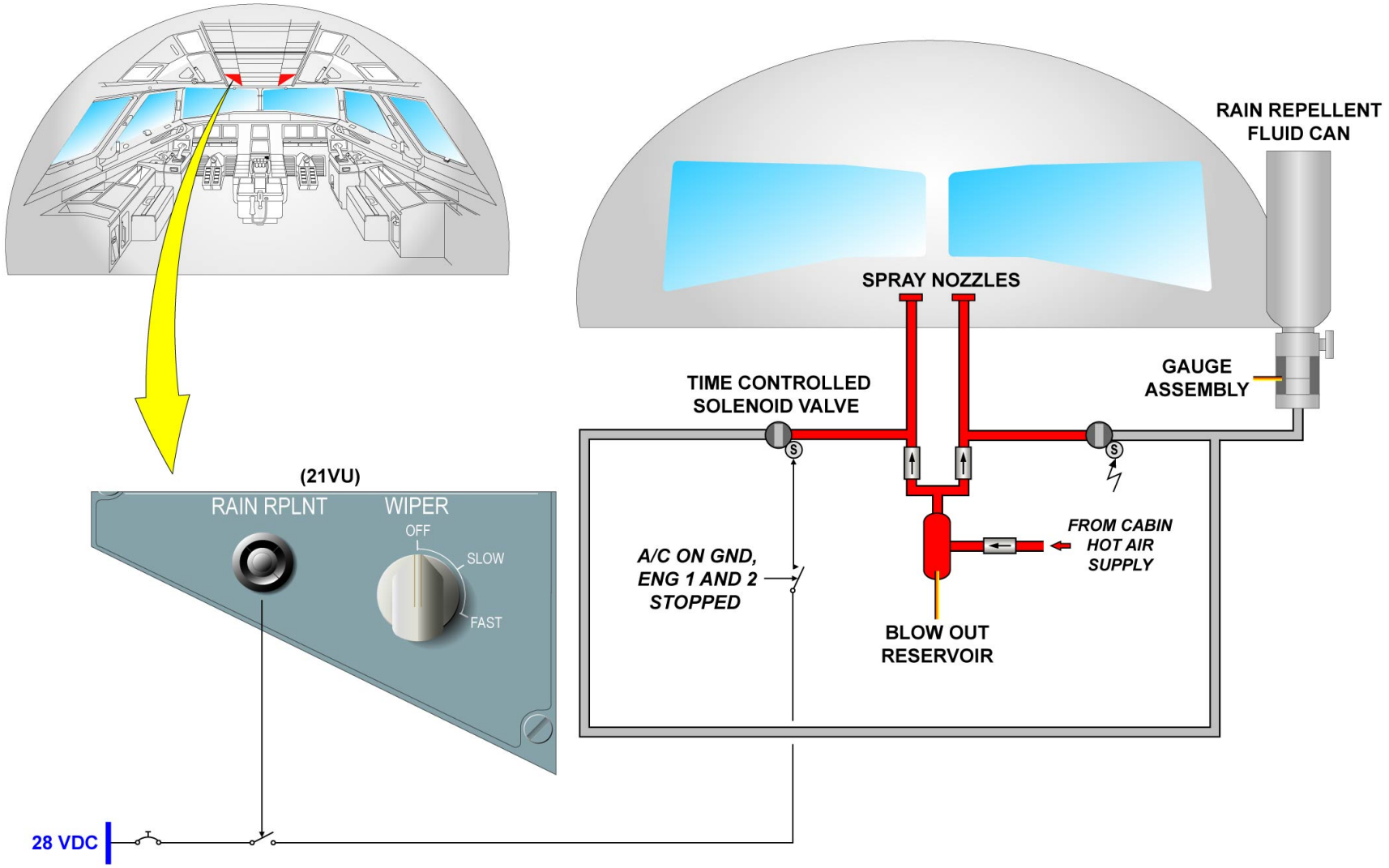
When the RAIN Repellent (RPLNT) P/B is pressed in, the solenoid valve opens for a short time. This causes a measured quantity of rain repellent liquid to be sprayed on to the related windshield. To repeat the cycle, the P/B must be pressed again. On ground, the rain repellent system is inhibited when both engines are shut down.

CAUTION

Make sure that the fluid does not stay on the A/C structure. If the fluid gets on the A/C structure, wash it off immediately with soap and water.

CAUTION: Do not apply the rain repellent fluid on a dry surface.

UGB13131 - U7ST0M0 - UM30P500000001

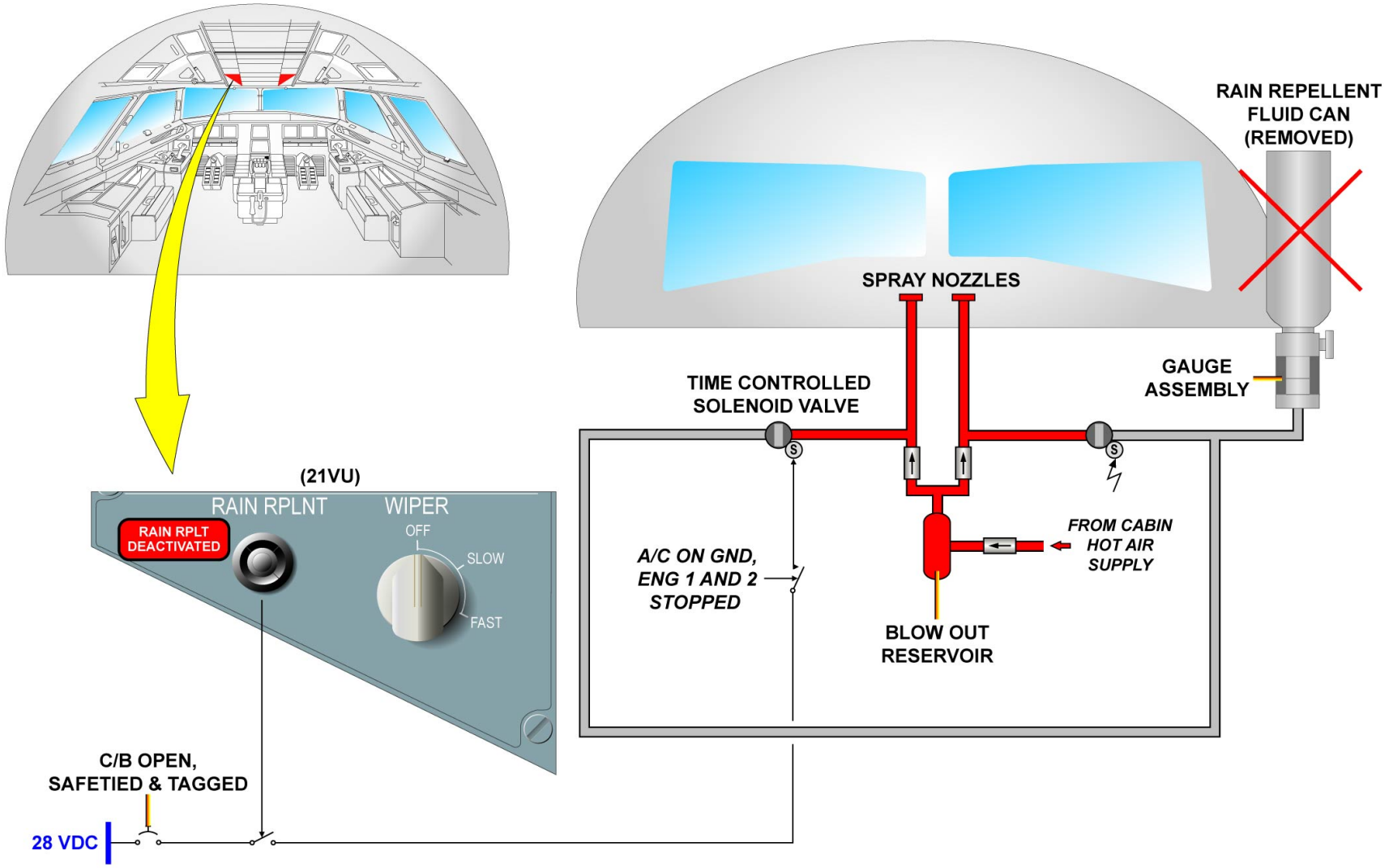


FUNCTION ... CAUTION

RAIN REPELLENT SYSTEM PRESENTATION (2)

DEACTIVATION

The system is still installed but can be optionally deactivated. For this the rain repellent bottle has been removed and C/B pulled, safetied and tagged. Clear visibility through the windshield is only achieved through the use of the wiper system.



DEACTIVATION

RAIN REPELLENT SYSTEM D/O (3)

GENERAL

The system is designed to improve visibility through the windshield in heavy rain, particularly when the wipers are not sufficient. The system operates independently on the CAPT side and on the F/O side.

RAIN REPELLENT CIRCUIT

The rain repellent fluid used is packaged in a nitrogen-pressurized can. The can is directly attached to the rain repellent fluid gauge. A purge P/B is used when the can is replaced. A nozzle sprays the rain repellent fluid onto the related windshield through four orifices. The spray nozzles are symmetrical but not interchangeable:
- the CAPT spray nozzle is identified with red paint mark,
- the F/O spray nozzle is identified with yellow paint mark.

PURGE CIRCUIT

The spray nozzle lines are permanently purged by air from cabin hot air supply. The blow-out reservoir works as a pressure accumulator, a decanting reservoir and has a test connection.

OPERATION

Upon actuation of the P/B, the time-controlled solenoid valve of the associated side releases out fluid to the spray nozzle for a preset period of time. To initiate a new cycle, it is necessary to release, then to press the P/B again. Between each cycle, the lines are automatically and permanently purged by hot air. The pressure indication shows the nitrogen pressure in the bottle. When the needle is in the yellow range, or the can is completely empty, the bottle should be replaced.

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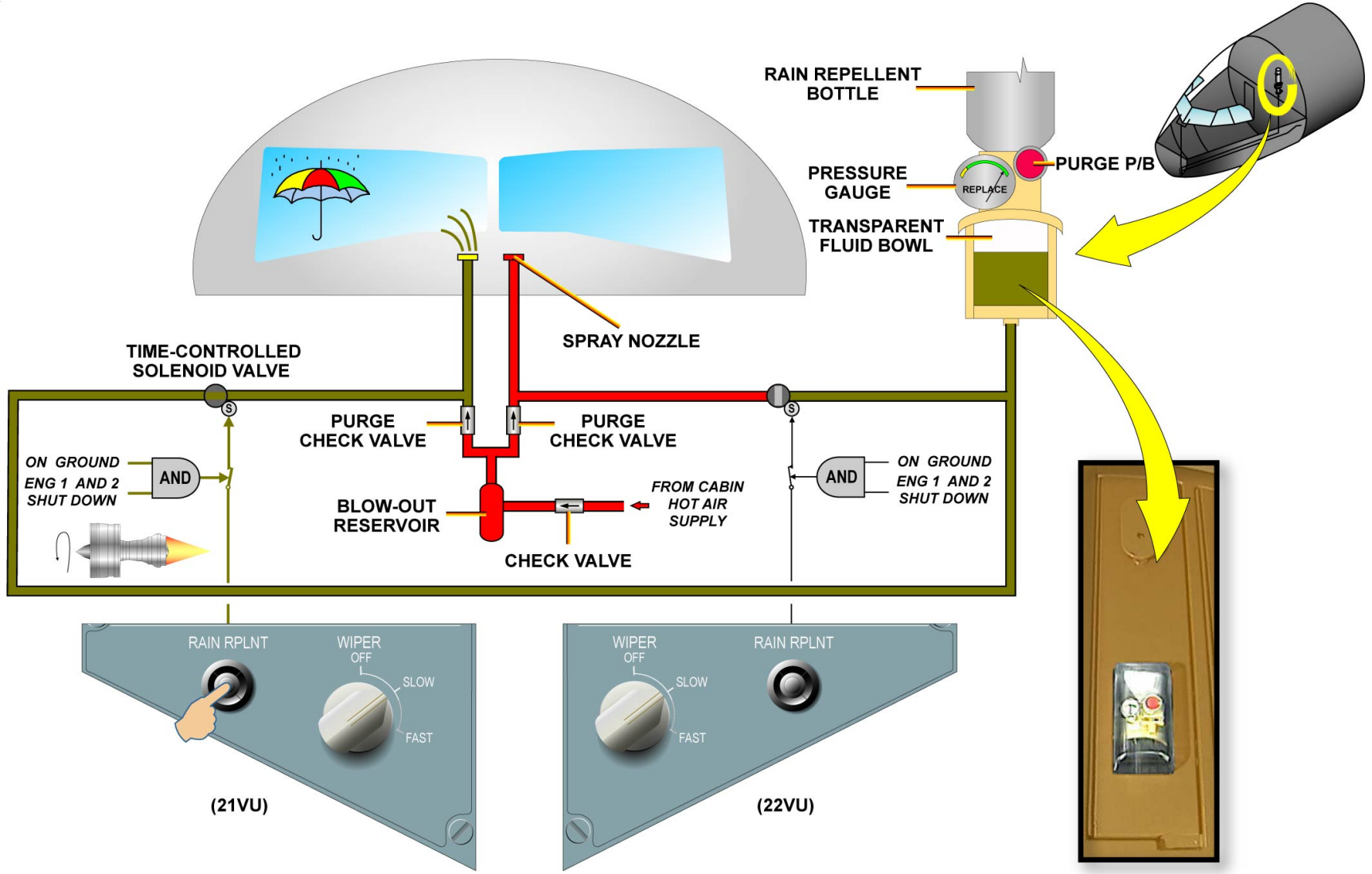

GENERAL ... OPERATION

SYSTEM PRESENTATION (2)

GENERAL

The wastewater from the galley and lavatory compartment washbasins is dumped overboard through drain masts.

CONTROL SUPPLY

To protect drain masts against ice formation, electrical heating, through an automatically controlled system, is supplied when the A/C is electrically supplied.

USERS

The flexible heater foil, bonded on the drain mast tube, is temperature regulated via a sensor and powered by the drain mast heating Control Unit (CU). The AC power supply line, within the drain mast, is installed with a thermal switch opening at 120°C (250°F). It will regulate the temperature in case of normal temperature control failure.

CONTROL UNIT

The CU regulates the temperature of the drain mast tube. The correct operation of the system is monitored by the BITE function of the CU. Each CU regulates the heating temperature of the associated drain mast tube between 6°C (43°F) and 10°C (50°F).

MONITORING

The system status is sent to the Cabin Intercommunication Data System (CIDS) for indication on the Flight Attendant Panel (FAP). The failure of the Heater (HTR) or CU is indicated on the FAP by a CIDS CAUTion light, and on the front face of the CU by HTR and CU lights. The drain mast data is stored in the Centralized Fault Display Interface Unit (CFDIU).

TEST

To perform a complete test of the drain mast system, two tests must be carried out, one from the MCDU, and the second one on each CU. If the test is satisfactory:
- on the MCDU, the message "TEST OK" is displayed,
- on the front face of the CU, the HTR and CU lights are ON as long as the associated TEST P/BSW is pressed in.

If we have a fault on that system, the information is indicated by a CAUT light on the FAP and can be seen on the SYSTEM INFO, on page:
"DRAINMASTS FAIL>
- CHECK WASTE WATER OVERFLOW FWD (AFT)".

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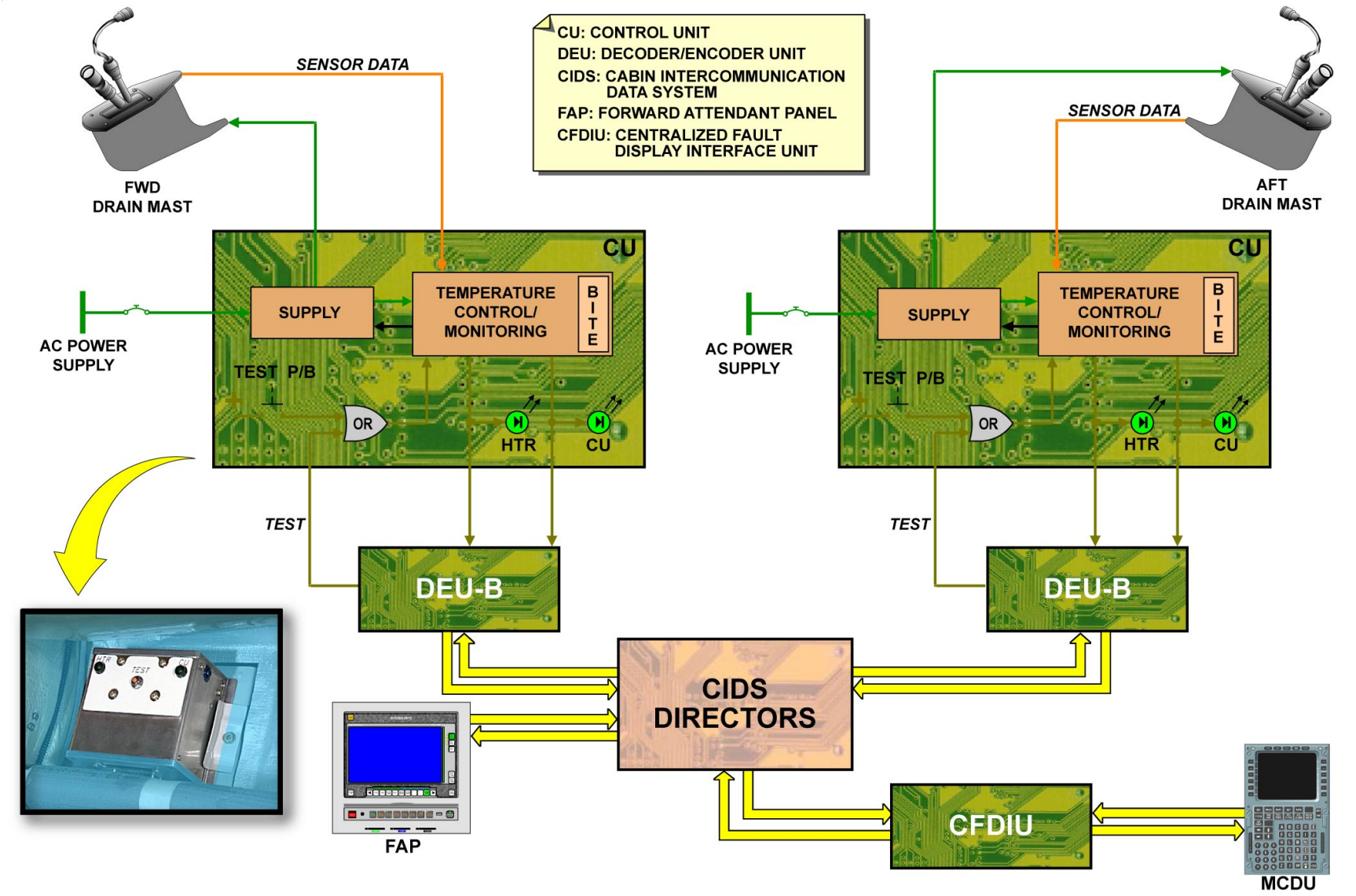


GENERAL ... TEST

SYSTEM PRESENTATION (2)

GENERAL

The potable and waste water lines in sections 13 and 14 are insulated and electrically heated to prevent ice formation in or around the water lines. The system comprises a control unit and heater assemblies associated to two sensors.

CONTROL SUPPLY

Each system operates as soon as the A/C is electrically supplied.

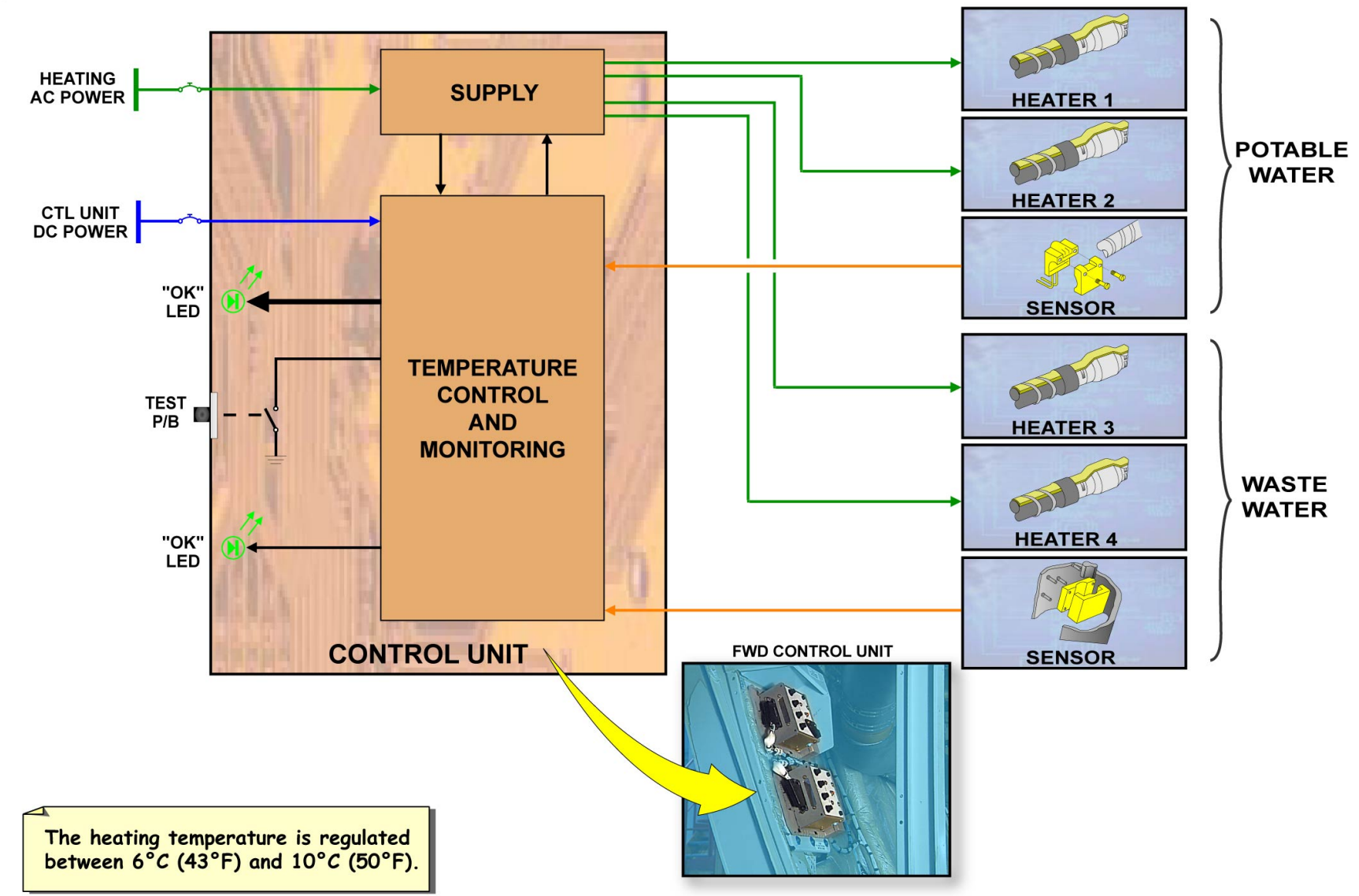
CONTROL UNIT

Each control unit regulates the temperature range of each group of heater assemblies via their respective sensor.

TEST

A manual test of the system is available via a P/B located on the control unit. On the front face of the control unit, two green "OK" LEDs come on if the test is satisfactory.

UGB13131 - U7ST0M0 - UM30P7000000001



GENERAL ... TEST

AIR STOP VALVE CARGO DRAINAGE SYS D/O (OPTION) (3)

general

Two air stop drain valves are installed on the forward and aft cargo compartment drainage lines, upstream of the forward and middle drain masts. These valves are electrically heated to prevent ice formation.

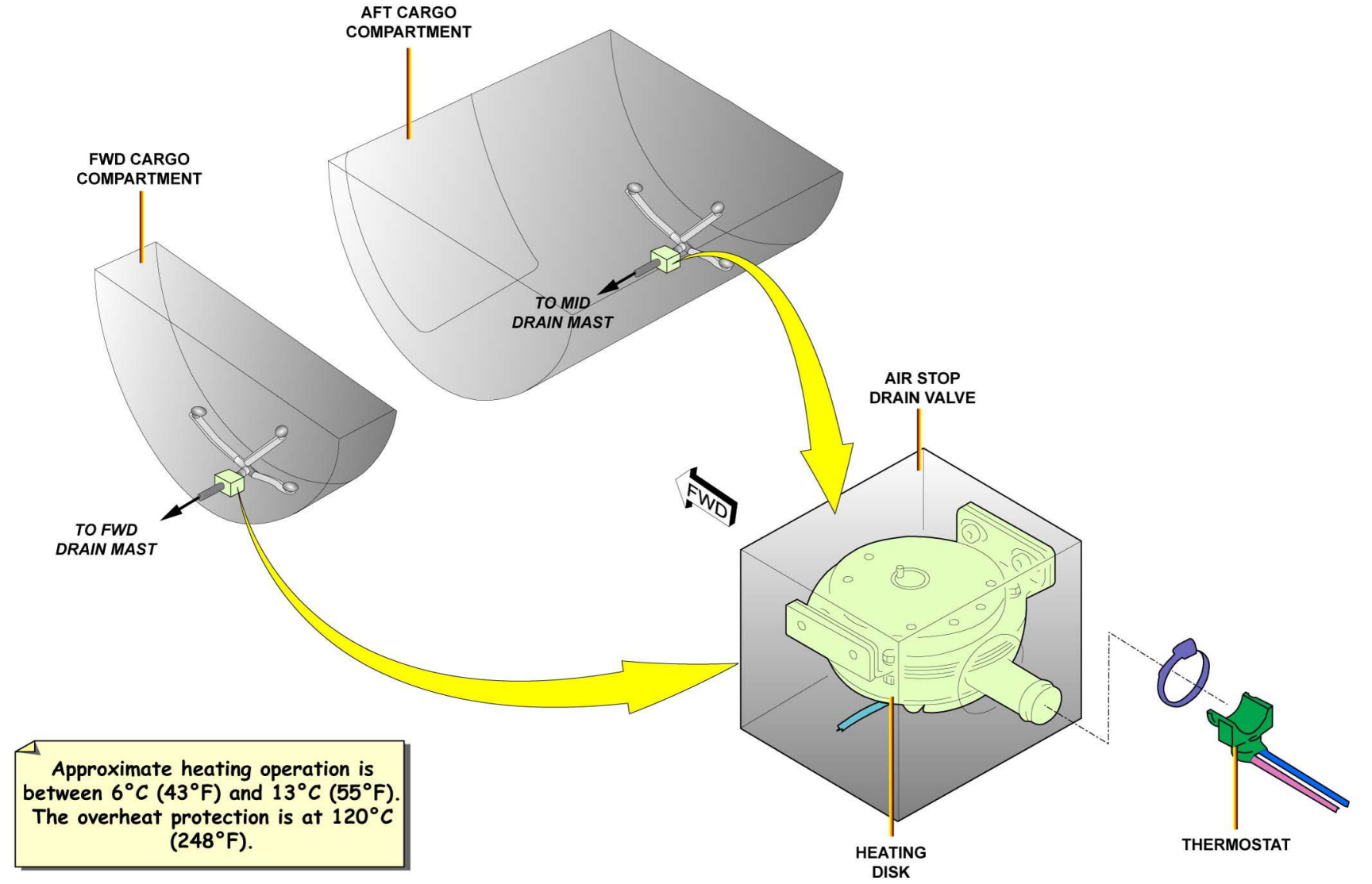
control supply

The system operates as soon as the aircraft is electrically supplied. The power supply is 115 V AC. This system is an option, as well as the MID drain masts.

temperature regulation

A thermostat controls the heating and the heater has an overheat protection.

UGB13131 - U7ST0M0 - UM30D6000000001


AFT CARGO COMPARTMENT
FWD CARGO COMPARTMENT
TO MID DRAIN MAST
TO FWD DRAIN MAST
AIR STOP DRAIN VALVE
FWD
Approximate heating operation is between 6°C (43°F) and 13°C (55°F). The overheat protection is at 120°C (248°F).
HEATING DISK
THERMOSTAT

GENERAL ... TEMPERATURE REGULATION

POTABLE WATER SERVICE PNL ANTI-ICE SYS D/O (3)

general

The fill/drain nipple at the potable water service panel is electrically heated to prevent ice formation.

NOTE: Note: On the A318/A319/A321 the overflow nipple at the potable water service panel is also electrically heated.

control supply

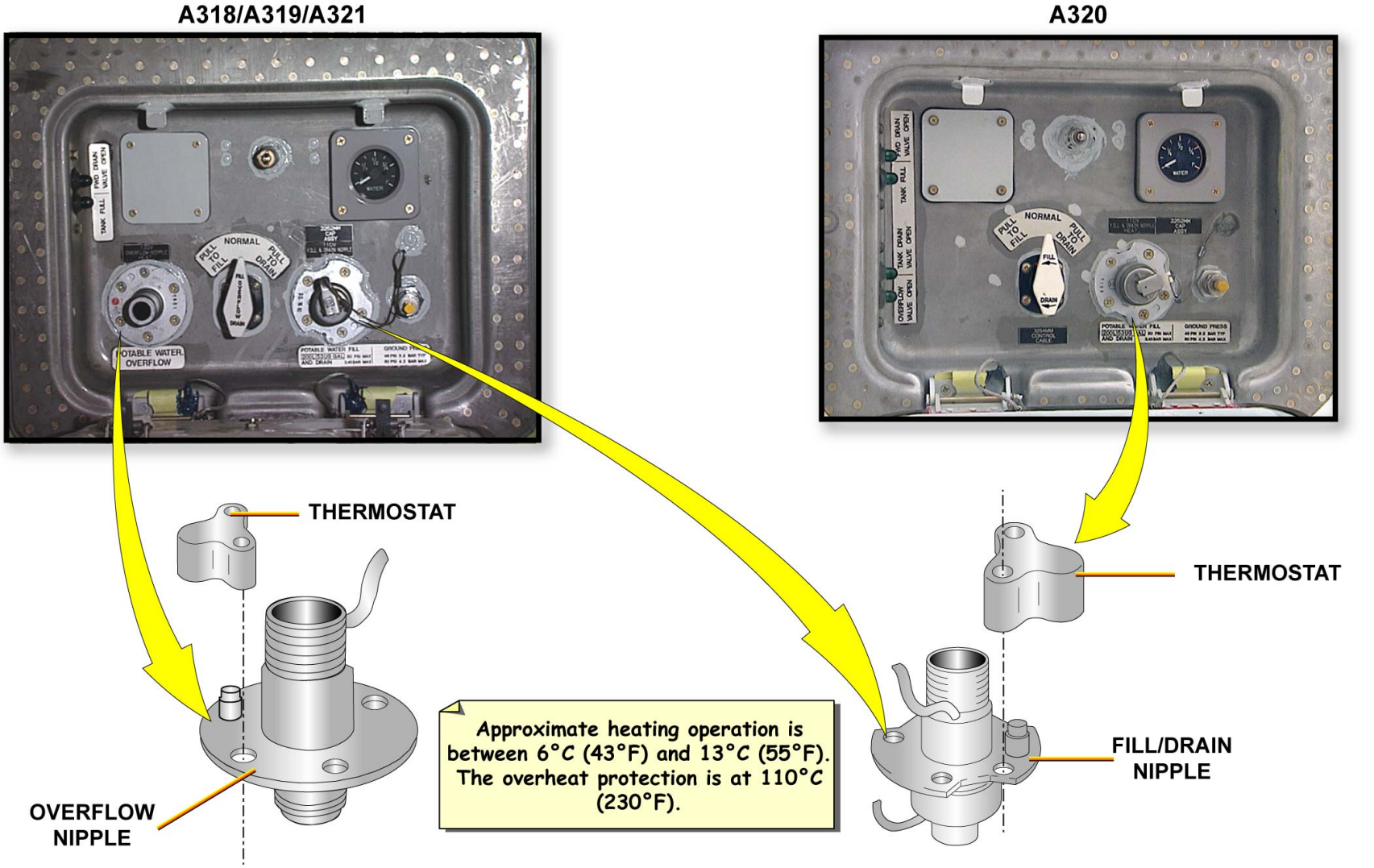
The system operates as soon as the aircraft is electrically supplied.

temperature regulation

A thermostat controls the heating and the heater has an overheat protection.

UGB13131 - U7ST0M0 - UM30D7000000001

POTABLE WATER SERVICE PANEL



GENERAL ... TEMPERATURE REGULATION

TOILET SERVICE PNL ANTI-ICE SYS D/O (OPTION) (3)

GENERAL

The Rinse nipple 21 DV, of the toilet service panel, is electrically heated up and controlled by the thermostat 22 DV, to prevent ice formation.

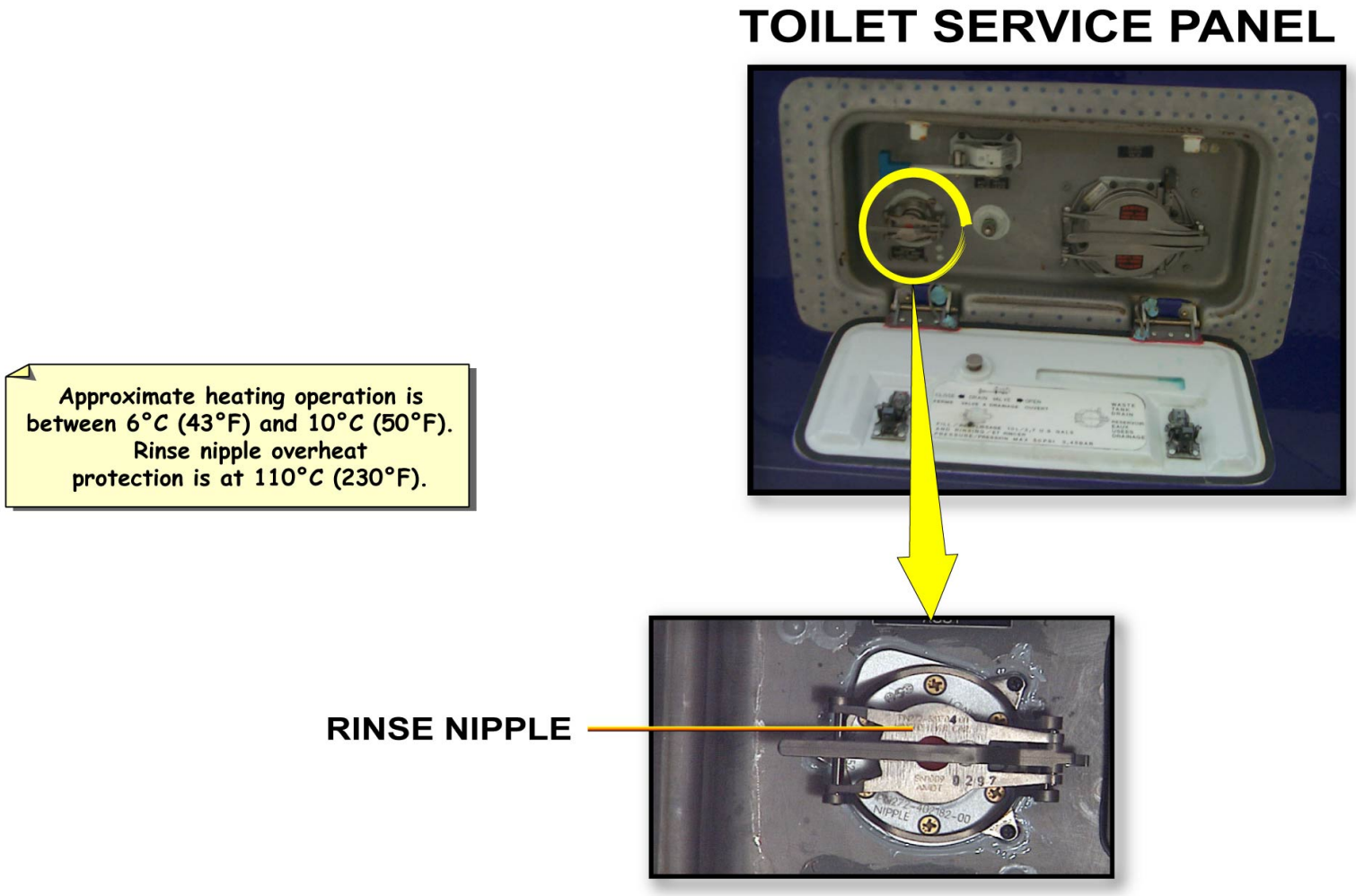
CONTROL SUPPLY

The system operates as soon as the A/C is electrically supplied.

CONTROL UNIT

A heating element is installed to the rinse nipple of the toilet service panel to give protection against ice formation. A temperature thermostat is installed adjacent to this element and permanently measures the nipple temperature. The temperature thermostat is connected to the heating element. When icing conditions occurs, the thermostat will turn on the element for heating.

UGB13131 - U7ST0M0 - UM30D8000000001


TOILET SERVICE PANEL
Approximate heating operation is between 6°C (43°F) and 10°C (50°F). Rinse nipple overheat protection is at 110°C (230°F).
RINSE NIPPLE

GENERAL ... CONTROL UNIT

SYSTEM PRESENTATION (3)

GENERAL

A visual ice indicator is installed in the central retainer of the windshield. It can be illuminated to check for icing conditions at night or in dark conditions.

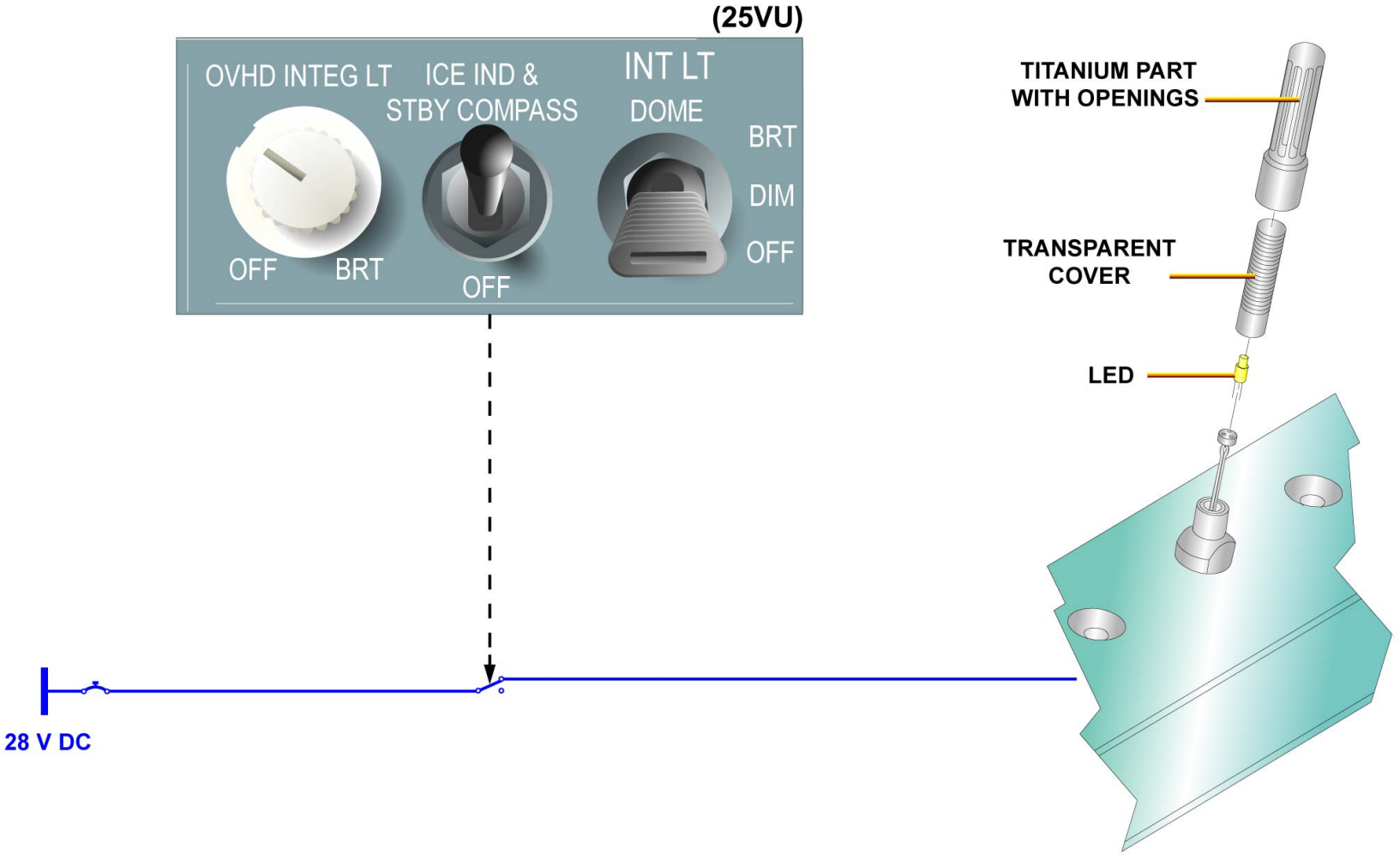
ICE INDICATOR

The ice indicator on has a titanium part with openings, a transparent cover and a Light Emitting Diode (LED).

CONTROL

The indicator light LED is supplied with 28 VDC and controlled by the ICE INDicator & STandBY COMPASS switch.

LED: Light Emitting Diode



GENERAL ... CONTROL

DUAL ADVISORY ICE DETECTION DESCRIPTION/OPERATION (3)

FUNCTION

The purpose of the dual advisory ice detection system is to supply:
- A better detection of icing conditions,
- Fuel saving by cutting off the hot air bleed for the anti-ice systems when the latter are no longer necessary.

The dual advisory ice detection system is made of two ice detectors installed on the aircraft skin and directly connected to the Flight Warning Computer (FWC) to send warning messages to the crew on the Engine/Warning Display (EWD).

DETECTION

Two levels of detection are given:
- "ICE DETECTED" corresponding to an elementary detection,
- "SEVERE ICE DETECTED" corresponding to 7 successive elementary detections.

The ice detection system is operating at electrical power-up. It sends warning messages when the aircraft is in flight, depending on the altitude and when Total Air Temperature (TAT) is below 8°C (46.4°F), even with one ice detector faulty.

FWC MESSAGES

The ice detectors generate three different discrete signals:
- "ICE DETECTED" signal when engine air intake anti-ice is necessary,
- "SEVERE ICE DETECTED" signal when wing anti-ice is necessary,
- "ICE DETECT FAULT" signal when the two ice detectors are faulty.

This displays class 1 warning messages on the EWD. These messages can be respectively inhibited by engine or wing anti-ice selection.

RESET

When wing anti-ice valves are controlled to open, two ground signals are sent to the ice detectors in order to reset the ice detection counter and cut off the "SEVERE" signal.

MONITORING

Each ice detector is installed with a BITE function for continuous monitoring. Each ice detector sends a "FAULT" signal to System Data Acquisition Concentrators (SDACs) 1 and 2 and to the Centralized Fault Display Interface Unit (CFDIU) in case of failure during either power-up, MCDU or in operation tests.
A class 2 fault message is displayed on the MCDU ANTI-ICE ICE DETECTOR 1 or 2 system page in case of ice detector failure.

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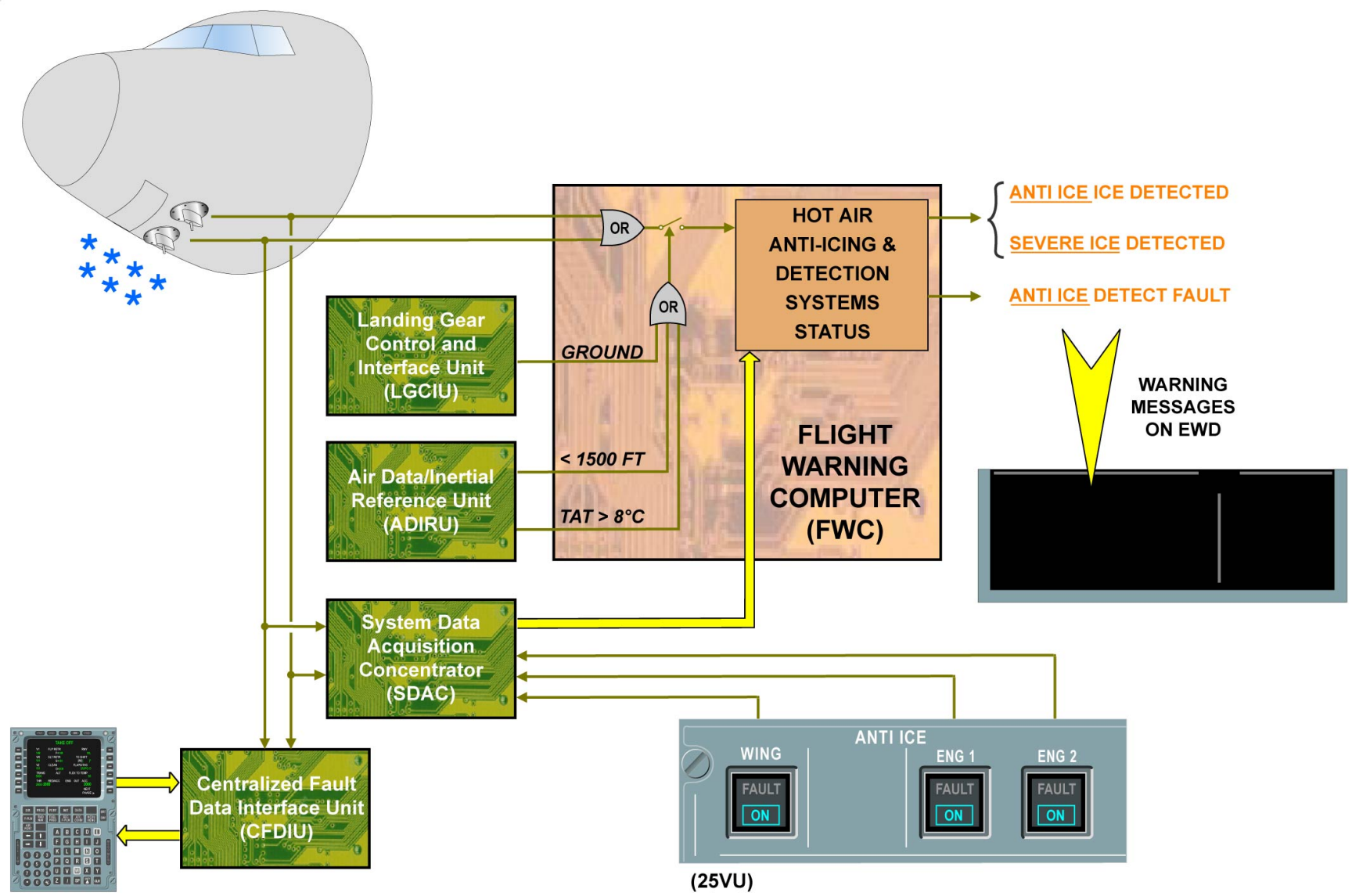


FUNCTION ... MONITORING

ICE AND RAIN PROTECTION SYSTEM LINE MAINTENANCE (2)

MEL/DEACTIVATION

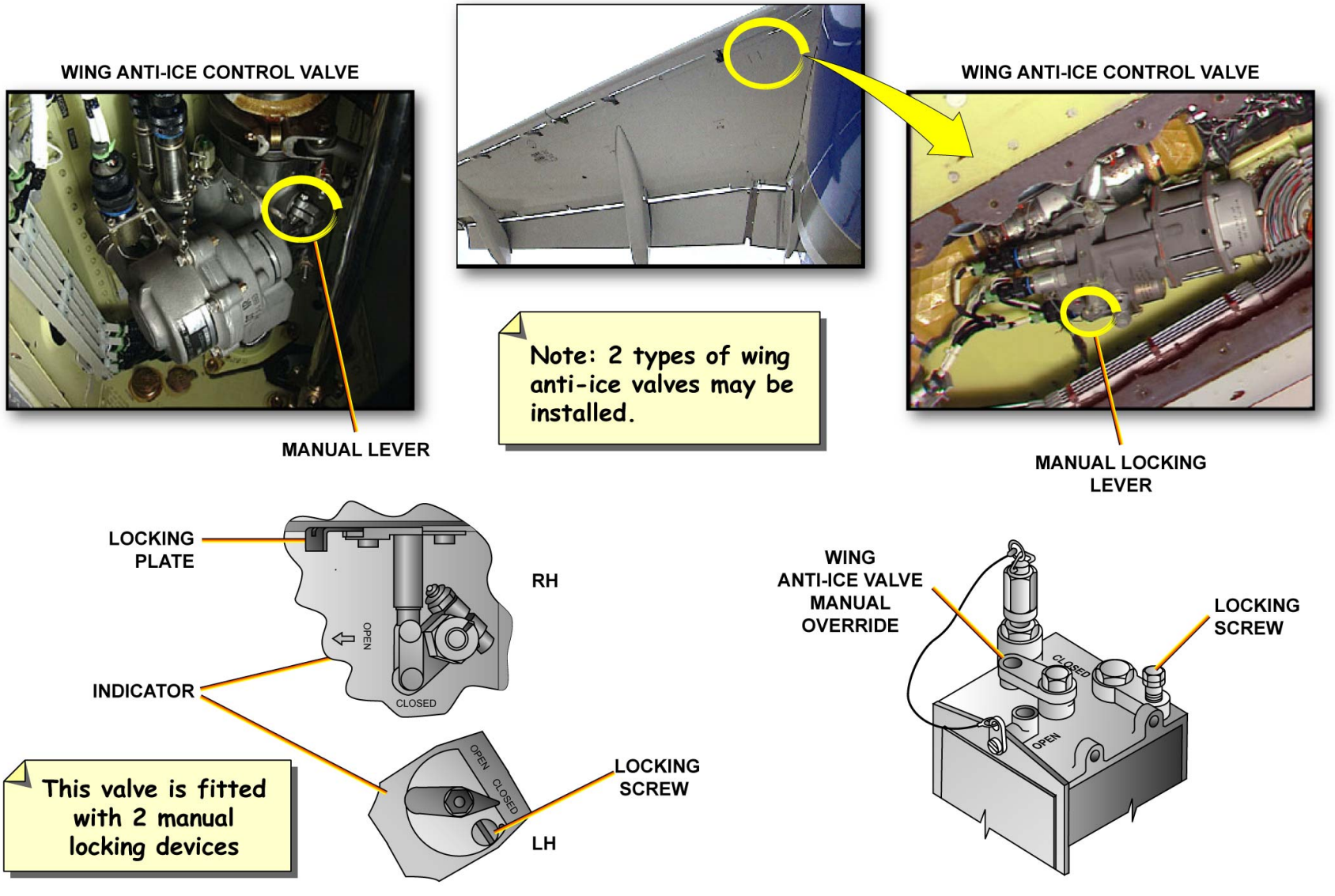
WING ICE PROTECTION

In case of failure, the aircraft may be dispatched per Minimum Equipment List with the RH WING anti-ice valve deactivated in the OPEN position or either valve in the CLOSED position. If the valve is deactivated OPEN, the associated engine bleed switch must be selected OFF until after takeoff. A flight manual performance penalty is applied (fuel consumption is increased by 1%). If the valve is deactivated CLOSED, the aircraft may not be flown into icing conditions.

Procedure:

- Install zero-locking tool on slat/flap lever to prevent movement,
- Depressurize bleed air system,
- Remove access panel on wing lower surface,
- Move the valve indicator to the required position and install the locking screw OR,
- Move the valve indicator to the required position and install the locking plate.

UGB13131 - U7ST0M0 - UM30BA000000002



MEL/DEACTIVATION - WING ICE PROTECTION

ICE AND RAIN PROTECTION SYSTEM LINE MAINTENANCE (2)

MEL/DEACTIVATION (continued)

ENGINE AIR INTAKE ICE PROTECTION

In case of failure, the aircraft may be dispatched per Minimum Equipment List with one ENGINE anti-ice valve deactivated in the OPEN or CLOSED position. If the valve is deactivated OPEN, a Flight Manual performance penalty must be applied. Based on temperature and altitude, the maximum weight, takeoff speeds and fuel consumption will be adjusted. If the valve is deactivated CLOSED, the aircraft may not be flown into icing conditions.
Procedure:
- Full Authority Digital Engine Control (FADEC) ground power OFF,
- open RH fan cowl,
- move the manual override to the required position.

Lock in place with the locking pin, for CFM and V2500 engines. For PW6000 engines, the air intake anti-ice valve is locked manually with the locking lever in the OPEN position or the CLOSED position.

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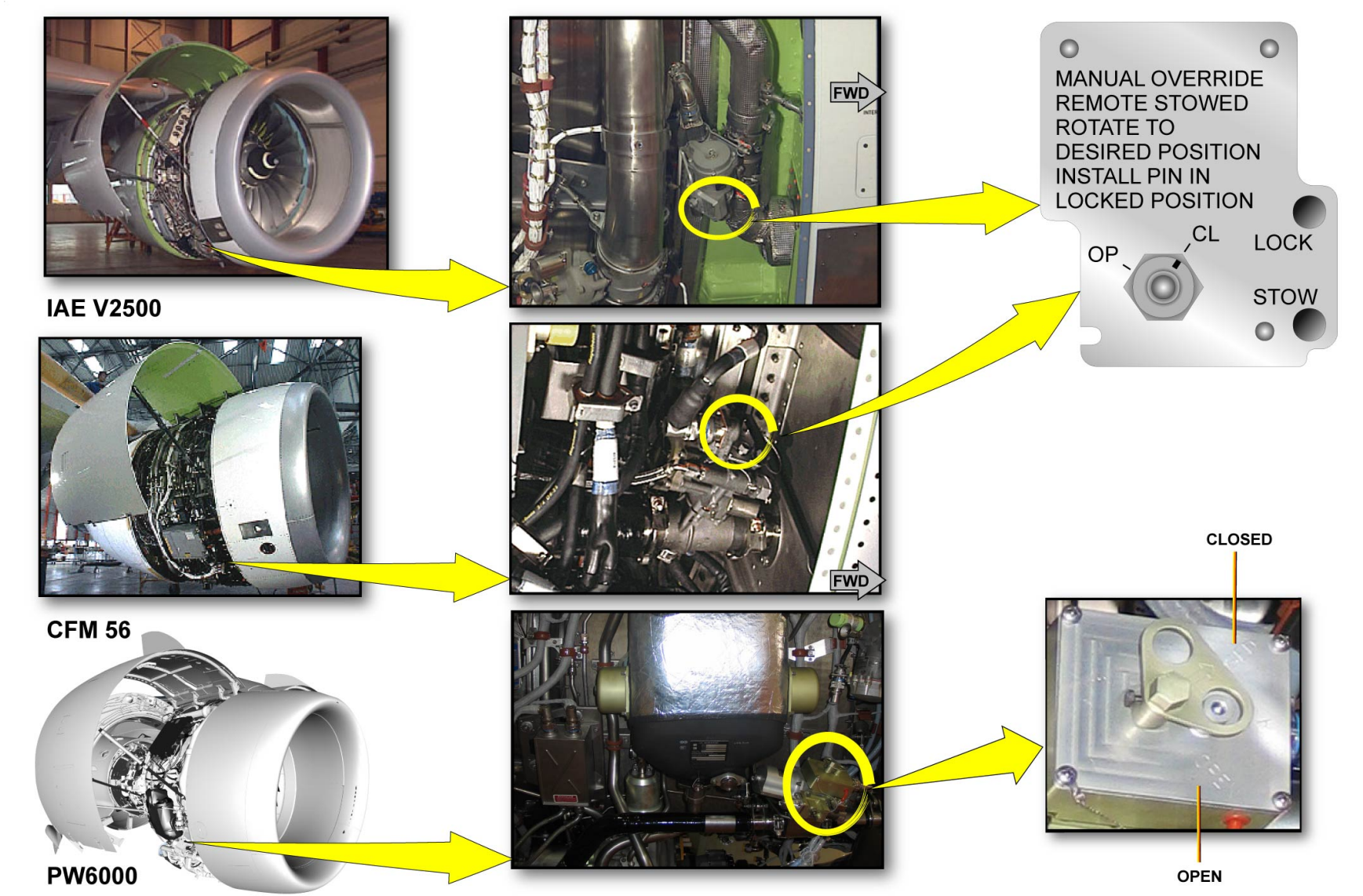


MEL/DEACTIVATION - ENGINE AIR INTAKE ICE PROTECTION

ICE AND RAIN PROTECTION SYSTEM LINE MAINTENANCE (2)

MEL/DEACTIVATION (continued)

DRAIN MAST ICE PROTECTION

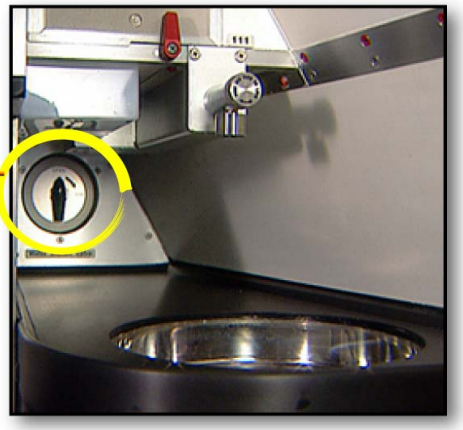
In case of a failure of a drain mast heater, the fault will be displayed on the Flight Attendant Panel (FAP) of the Cabin Intercommunication Data System (CIDS). The aircraft may be dispatched per Minimum Equipment List with the drain mast heater inoperative. The water supply to the LAVatory(ies) (LAV(s)) and galley which use the failed drain mast must be shut off. As a result, the LAV(s). will not be usable and must be secured closed and locked.

UGB13131 - U7ST0M0 - UM30BA000000002

FLIGHT ATTENDANT PANEL (FAP)

LAVATORY WATER
SHUT-OFF VALVE

GALLEY WATER
SHUT-OFF VALVE



MEL/DEACTIVATION - DRAIN MAST ICE PROTECTION

ICE AND RAIN PROTECTION SYSTEM LINE MAINTENANCE (2)

MAINTENANCE TIPS

When the aircraft is parked, it is recommended to install protective covers on the air data probes (static ports, pitot probes, AOA probes, TAT probes). The protective covers help protect the probes from contamination. The covers should be marked with REMOVE BEFORE FLIGHT. Ground personnel must insure that the covers are removed before flight or before power is applied to the probes (engine start or ground test).
The probe heat system operates automatically to power the air data probe heaters when at least one engine is running. It is also designed to operate automatically when the aircraft is in flight. During the troubleshooting and the on ground operations, observe the following precautions:
- if the Probe Heat Computer (PHC) power supply C/B is pulled, the PHC internal relay will relax and the related probes will be heated. Make sure to pull ALL of the associated probe heat C/B's (Static supply (28VDC), AOA supply, Pitot supply & TAT supply (all 115 VAC)).
- if the Engine Interface Unit (EIU) power supply C/B is pulled, the PHC will sense an "engine running" condition and the probes will be heated. Make sure to pull ALL of the probe heat C/B's (Static supply (28VDC), AOA supply, Pitot supply & TAT supply (all 115 VAC)).
- if the C/B of the LGCIU is pulled, it simulates FLIGHT situation. So the probe heating is also switched ON.

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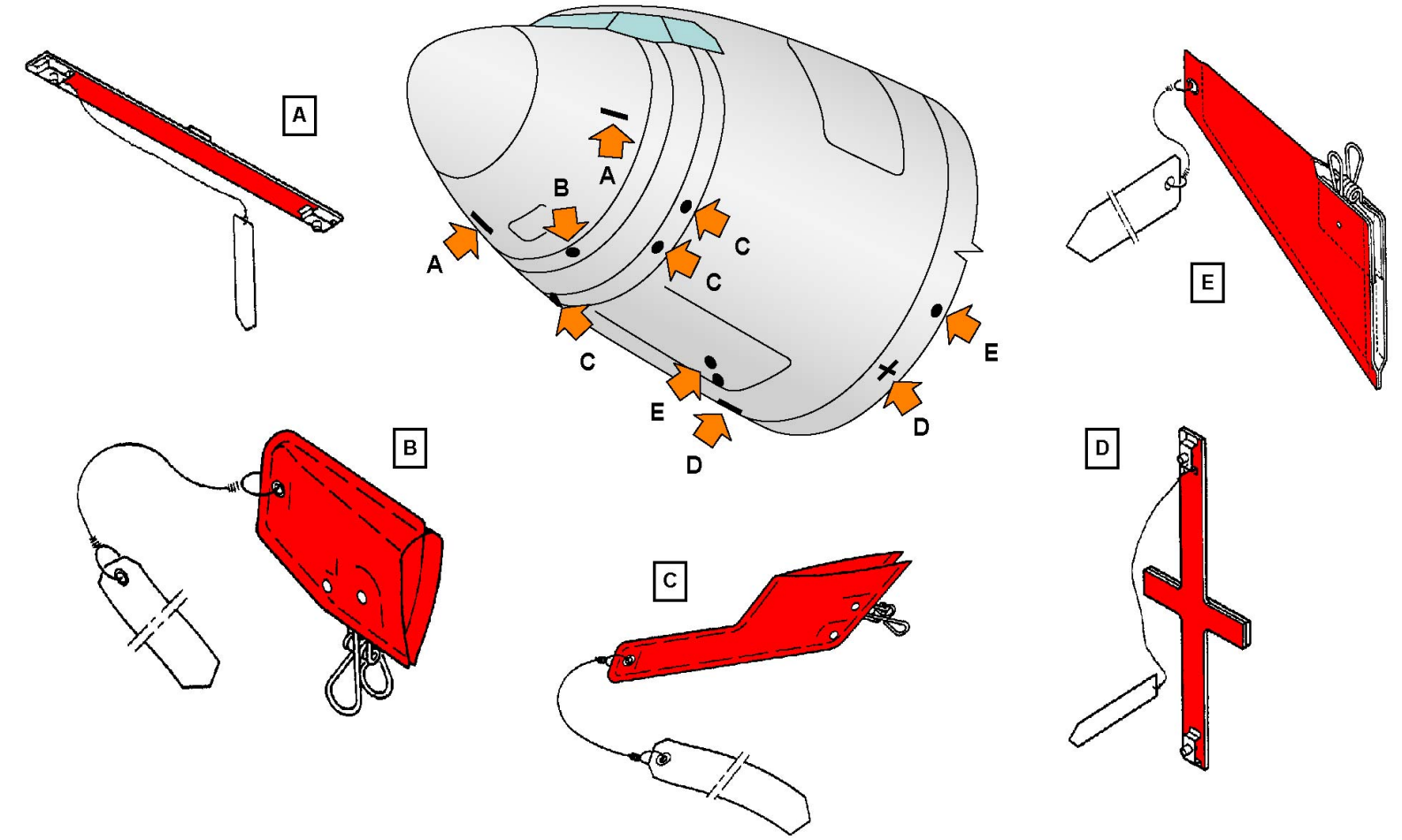

MAINTENANCE TIPS

AIRBUS S.A.S.
31707 BLAGNAC cedex, FRANCE
STM
REFERENCE UGB13131
APRIL 2013
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